SURGICAL ASPECTS OF MEDICINE

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Edited by

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LONDON

BUTTERWORTH & CO (PUBLISHERS) LTD

1959

AFRICA	BUTTERWORTH & CO (AFRICA) LTD DURBAN 33/35 BEACH GROVE
AUSTRALIA	BUTTERWORTH & CO (AUSTRALIA) LTD SYDNEY 8 O CONNELL STREET MELBOURNE 430 BOURKE STREET BRISBANE 240 QUEEN STREET
CANADA	BUTTERWORTH & CO (CANADA) LTD TORONTO 1367 DANFORTH AVENUE
NEW ZEALAND	BUTTERWORTH & CO (AUSTRALIA) LTD WELLINGTON 49/51 BALLANCE STREET AUCKLAND 35 HIGH STREET

PRINTED IN GREAT BRITAIN BY
R. J ACFORD LTD INDUSTRIAL ESTATE
CHICHESTER SUSSEX

FOREWORD

MEDICINE in the widest sense includes both surgery and medicine in a narrower sense In choosing his title for this book the editor has emphasised that surgery is but an aspect of medicine in the broadest sense—albeit an essential one

As much art resides in judging when to withhold operation as in knowing when to recommend it and it is not a rare mistake to imagine that to oppose surgery on all occasions constitutes excellence in the first of these Yet failure on the part of his physician to acknowledge or be aware of a need for surgery may cost a patient his health a limb or even his life Well informed and up-to-date evaluation of operation is an essential element in the practice of good medicine

However few physicians have the inclination to own or the time to consult large volumes on post graduate surgery much less current surgical journals, though most probably possess and occasionally refer to an old edition of some student textbook Even in this however the greater bulk of the material has long since ceased to have any relevance to their work

Since in Great Britain surgeons prefer to treat only patients referred to them from consultant colleagues or from general practitioners it is implied that the choice of time for changing from medical to surgical management of a patient must rest in the first place with his physician Yet this choice can be sound only if based upon such knowledge of the present-day results of operation as is possessed only by the practising surgeon The editor has therefore set out to provide some of this information in a concise form expressly designed for the busy physician and family doctor and dealing only with those aspects of surgery of continuing importance to them such as indications for and results of operation

In doing this however the editor has achieved a book which I believe will also have considerable value for trainee consultants both medical and surgical as well as for many established general surgeons occasionally called upon to make decisions in fields in which they have had no opportunity to accumulate specialized experience and wisdom

London
June 1959

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INTRODUCTION

THE MOST difficult problem in the production of this work has been the choice of a title This was because the purpose of the book was clear in our minds from the start but defied short and comprehensive definition Among other titles we considered A Time for Surgery The Use of Surgery , The Why When and After of Surgery A Physician s Guide to Surgery and Surgical Indications and Results each of which emphasizes one or another aspect of our intentions

In the main this book deals with the indications for operation and its results Our aim has been first to give help and guidance in deciding when the time has come for a change from conservative to operative management of disease secondly to discuss briefly the choice between alternative techniques of surgical treatment thirdly to provide information on the present-day mortality morbidity side effects and late complications of surgical procedures and fourthly to advise on the management of the patient s life subsequent to operation in *short to cover comprehensively all those* aspects but only those aspects of surgery of *interest to* the consultant physician and the family doctor while only where specially called for *touching upon* questions of diagnosis and details of technique We have also incorporated other material of a surgical flavour which we judged would be of interest to the same readers

No attempt has been made to be comprehensive of all problems, rather have we concentrated upon those common ones which we have considered to involve difficult decisions and borderline cases We have also entered upon some less frequented fields in which there has been recent progress or a change of approach Similar considerations have led us to make a few exceptions to the exclusion of neoplasms the rest of which were omitted on the grounds that most new growths are recognized to be surgical problems as soon as discovered No doubt our critics will detect our oversights and will guide us towards improvements which might be made in any future editions

The arrangement of the sections has been largely dictated by the order in which they became ready for the printer and the appearance of three of the editor s own chapters at the beginning is fortuitous

Any seed of merit which may have existed in the original conception of this work was helped to take root by encouragement and advice from friends in several fields of medical practice particularly Dr Oliver Plowright For its ultimate fruition it has depended upon the labours and enthusiasms of our contributors No editor was ever more loyally supported or had more helpful publishers

London
June 1959

H DAINTREE JOHNSON

CHAPTER 1

REFLUX OESOPHAGITIS AND HIATUS HERNIA

H DAINTREE JOHNSON AND E W HART

INTRODUCTION

FOR MANY years heartburn and belching were regarded as manifestations of very minor dyspepsia often of functional origin and suitable for management at domestic level Only comparatively recently has it come to be realized that they are the characteristic symptoms of incompetence of the sphincteric mechanism at the oesophagogastric junction and often clues to important lesions

Heartburn

If the cardia is incompetent reflux of gastric contents into the gullet with heartburn tends to occur when the stomach is full particularly on stooping or straining and on lying flat If the material regurgitated is sufficiently erosive oesophagitis develops The oesophagus then goes into spasm and having a powerful longitudinal muscle tends to draw the cardia through the oesophageal hiatus of the diaphragm Reflux oesophagitis is commonly encountered in patients without evidence of hiatal hernias but hernias appeared later in several such patients followed for a number of years by the author When herniation occurs the competence of the sphincteric mechanism is further undermined and a vicious circle is established In time the inflamed oesophagus becomes densely fibrotic and permanently shortened and then presents a most difficult and recalcitrant surgical problem

Belching

The larger part of all wind eructated from the stomach is swallowed air and excessive belching always implies copious air swallowing Although this is often considered to be due to perversity or neurosis it is the author s view that the swallowing of air is often a natural physiological response to loss of the gastric air bubble through an incompetent cardia and the repeated return of the air swallowed is further evidence of this incompetence

Causes of incompetence of the cardia

Many different factors can contribute to the development of incompetence at the oesophagogastric junction and a local abnormality may be one of the least of these Often the incompetence is secondary to other lesions an important group being those which occupy space in the abdomen—such as ascites ovarian cysts pregnancy an enlarged liver perhaps constipation and an obese omentum particularly if the patient wears tight corsets

Gastric retention encourages reflux and heartburn is a frequent complaint in patients with duodenal or prepyloric ulcers with pyloric obstruction Once a hiatus hernia has formed reflux is usually free and oesophagitis commonly severe

Since relaxation of the cardiac sphincter accompanies vomiting it is possible

that such relaxation can result reflexly from stimuli which fail to evoke the complete vomiting response Gall stones and gall bladder disease are often accompanied by flatulence and this might either be because of some such reflex effect or because gall bladder disease and oesophagogastric incompetence are both common in fat, middle aged women

REFLUX OESOPHAGITIS AND HIATUS HERNIA IN THE ADULT

Classification

There are two main types of hiatus hernia Much the commonest is the 'sliding type already described, in which the oesophagus is shortened and reflux oesophagitis is present Whether such a hernia is ever a primary lesion is doubtful and the theory that the shortness of the oesophagus is congenital has largely been abandoned There is however a rare anomaly described by Barrett (1954) which may be congenital In this the lowest few inches of what appears externally to be normal oesophagus is lined by gastric epithelium

The other main variety is the para oesophageal or rolling hernia in which part of the stomach passes up beside the oesophagus but the cardia remains below the diaphragm In this lesion the hiatus is often found to be greatly enlarged The hernias also tend to be big and occasionally the entire stomach except for the cardia and pylorus occupies the chest the greater curve being uppermost However para oesophageal hernias are rarely associated with reflux oesophagitis and heartburn is seldom a complaint If oesophagitis does develop the oesophagus may begin to shorten and for a while the hernia may have intermediate or transitional features

Symptoms

In addition to excessive belching and heartburn made worse by recumbency or effort patients with hiatal hernias and reflux oesophagitis may complain of a number of other symptoms These include pain high in the epigastrium and beneath the sternum pain in the chest most commonly behind the left nipple pain at the medial border of the scapula usually the right pain in the ear throat jaw or even referred down the left arm Gripping pain in the chest radiating to the throat like angina pectoris may come on suddenly during exercise, or in the middle of the night or when slumped in an armchair A change in posture such as sitting up and straightening the back will sometimes relieve it Dysphagia and vomiting are occasional complaints

Investigations

The diagnosis of reflux oesophagitis is confirmed and its severity assessed by oesophagoscopy At the same time palpation with a bougie will discover any beginnings of a stricture If dysphagia has been present oesophagoscopy and gastroscopy are essential to exclude neoplasm for carcinoma near the cardia is rarely diagnosed radiologically until it is advanced A radiograph may reveal a large established hiatus hernia but often fails to demonstrate a small one Radiology is of little help in the diagnosis of reflux oesophagitis but should always be used in the search for a primary lesion such as duodenal scarring

Management of reflux oesophagitis

The first essential in a patient with reflux oesophagitis with or without hiatus hernia is to exclude any primary lesion requiring treatment on its own account

such as ovarian cyst duodenal ulcer gall stones and so forth Weight reduction is often the most important element in the management and tight corsets must be abandoned If the patient wears a surgical belt or spinal appliance the colleague who ordered it should be consulted to see whether it can possibly be discarded The second line of treatment is postural Stooping and straining should be avoided and the patient is urged to sleep well propped up on four pillows (Fig 1) After a while the patient learns to maintain this position without difficulty but at first blocks under the foot of the bed help to prevent him from slipping down Most patients are very much better if they lie always on the left side though the occasional one reports the opposite

Patients with spinal lesions commonly suffer from reflux oesophagitis but cannot tolerate this propped up position They should instead lie flat with the *head* of the bed raised on thick blocks

Alcohol should be forbidden and tea or coffee taken very weak and only in small quantities—not more than one cupful at a time and never apart from food Nothing but milk is allowed within 3 hours of bed time Finally free use should be made of an innocuous antacid such as aluminium hydroxide whenever heart burn occurs

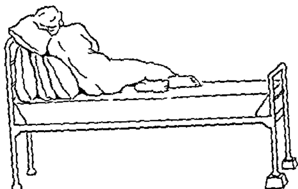


Fig 1 The position to be adopted at night by patients suffering from heartburn Once the posture has become habitual the blocks may be discarded

Heartburn in pregnancy

Reflux oesophagitis is so common in pregnancy that it is apt to be thought of as a necessary accompaniment to be stoically borne However this is a dangerous attitude for hiatus hernia commonly starts during pregnancy and unless the oesophagitis is brought under control the hernia may become established Rigler and Eneboe (1935) demonstrated hiatal herniation in 5 per cent of primiparae and 18 per cent of multiparae in the third trimester of pregnancy Of these 2 out of 5 were still present after parturition

Complications

It is usual to list duodenal and gastric ulcers as complications of hiatus hernia They are certainly commonly associated but it is questionable which comes first the hernia or the ulcer The problem has been discussed elsewhere (Johnson 1955 1957) Sometimes a gastric ulcer appears in the herniated part of the stomach and it is then often diagnosed radiologically as an oesophageal ulcer

Massive bleeding from the oesophagus may give rise to haematemesis but chronic anaemia without obvious haemorrhage is very much more common

Anaemia also complicates para oesophageal hernias which are not associated with oesophagitis and the blood is probably then being lost from a chronically engorged herniated gastric pouch

Dysphagia and vomiting are often mentioned as symptoms of reflux oesophagitis and hiatus hernia Though sometimes apparently due to attacks of muscle spasm they always suggest the onset of a stricture Fibrous strictures are seen most commonly in the aged and are a serious and sometimes recalcitrant complication In elderly patients the strictures are dilated if possible, with bougies A stricture limits reflux and benefits oesophagitis and its dilatation may lead to a flare up of old inflammation After dilatation it is therefore imperative to institute a strict regime of management for the reflux When this is successful repeated bouginage can often be performed at lengthening intervals ultimately of several months Carcinoma both of the stomach and of the oesophagus has occurred in association with hiatus hernia and must be borne in mind when the patient complains of dysphagia

A complication of oesophageal reflux which is not so widely known as it should be, is aspiration pneumonia A patient who comes to surgery for a hiatus hernia occasionally has a history of several attacks of pneumonia or is found to have bronchiectasis, and the primary cause has rarely been recognized Sleeping with the shoulders raised helps to protect patients from this complication

Reflux oesophagitis and gall stones

For many years it has been customary to ascribe flatulent dyspepsia to gall bladder disease but since cholecystectomy often fails to cure the flatulence it is uncertain whether the cholecystitis was the cause of it There is no doubt that hiatus hernia and gall stones are occasionally associated, occurring as they both do mostly in obese middle aged women An earlier operation for gall stones without relief of the symptoms complained of is a familiar history in patients with hiatal hernias and a right subcostal scar has been included in one description of the reflux oesophagitis syndrome Old thoracotomy scars are now sometimes seen in patients with gall stones and in these patients too operation may have failed to cure the symptoms

Indications for operation

Some of the lesions causing reflux oesophagitis may require surgery on their own account ovarian cysts duodenal ulcers and so forth Should a hiatus hernia be found as well many surgeons would perform some kind of herniorrhaphy at the same time However once the cause has been removed reflux oesophagitis is often cured and even radiological evidence of a small hernia may vanish Moreover many herniorrhaphies do more harm than good to the delicate mechanism controlling hiatal competence Unless the oesophagus is already badly damaged therefore the oesophagitis is best given every opportunity to recover on its own

When no primary lesion is present the treatment of reflux oesophagitis should in the first place be conservative whether a small sliding hernia is present or not but if in the presence of a hernia the usual measures including weight reduction fail and the symptoms are severe or if the hernia is continuing to increase in size the hernia should be dealt with surgically Operation may also become necessary because of complications—the onset of a stricture in middle or late middle age recurrent haemorrhage uncontrollable anaemia associated duodenal gastric or

oesophageal ulcer Attempts to cure reflux operatively, in the absence of a hernia have been less often successful and operation should not be undertaken unless complications have arisen

Oddly enough it is the smallest hernias that are associated with the most severe heartburn and large hernias are *sometimes symptomless* If no complications are present symptomless hernias particularly in older patients should in the writer s view be left alone However it must be acknowledged that this policy is not altogether free from risks and many surgeons do not agree with it The issue cannot be settled until enough patients have been followed on conservative management and the risks accurately assessed

Para oesophageal hernias in particular often give rise to no symptoms but they may have to be operated on because of persistent anaemia or even rarely because of obstruction or strangulation

Choice of operation

Controversy occasionally breaks out at surgical meetings between the protagonists of thoracic and of abdominal approaches for the repair of hiatal hernias but a mental attitude imprisoned either beneath or above the phrenic curtain is not well adapted to the solving of the problem since a hiatus hernia *is a thoracic lesion* with abdominal causes The writer found the thoracic very much the easier operation but abandoned it after becoming convinced that it is so much more important to look for a cause and eradicate it than to repair a hernia however beautifully and miss an intra abdominal cause or associated lesion Although the opening of both cavities provides an opportunity for treatment satisfactory from every point of view the standard abdominothoracic approach has been considered too disturbing to be justified for a lesion of no greater magnitude than a hiatus hernia Division of the diaphragm or damage to its nerve supply is certainly to be avoided Indeed the writer has seen two recurrent hiatal hernias associated with new additional hernias through the diaphragmatic wounds

A very satisfactory exposure is provided however by dividing the costal margin near the tip of the ninth rib and opening both the abdomen and chest a short distance above and below this level Only the outer 2 inches of the diaphragm is split Herniorrhaphy is then easy and is performed partly from above but only after laparotomy has excluded any causative or associated abdominal lesion At the end of the operation if the lung has not been allowed to collapse and the thoracic field is bloodless the wound may be carefully repaired and underwater drainage of the chest omitted

If the oesophagitis is not of too long standing nor of great severity reduction of the hernia is often easy The es ence of the operation is believed by many to lie in the fixation of the stomach below the diaphragm Some regard the phreno oesophageal ligaments as vital for this purpose while others have even questioned their existence

Severe oesophagitis can so shorten the oesophagus by fibrosis that reduction of the hernia becomes impossible and this is commonly so when a stricture is present In this circumstance Merendino Varco and Wangensteen (1949) recommended transferring the hiatus to the top of the diaphragmatic dome Since the oesophagus is then surrounded by aponeurosis instead of muscle loss of hiatal competence must result Nevertheless Effler and Collins (1951) claimed good results with this method and this supports a view suggested by recent researches (Fyke Cody and Schlegel 1956 Botha Astley and Carré 1957) that the diaphragmatic pinchcock

is less important than other mechanisms for preventing reflux In the writer s belief one more important factor is collapse of the short section of flaccid oeso phagus beneath the diaphragm owing to the thoraco abdominal pressure difference

On and off for many years surgeons including the author have been using isolated pedicled segments of jejunum to lengthen the inextensible shortened oesophagus but have always been haunted by the fear of peptic ulceration of the segment Others have tackled peptic oesophagitis and stricture by short circuiting the stomach altogether by oesophagojejunostomy (Allison Wooler and Gunning 1957) Partial gastrectomy has also had its advocates and will cer tainly be indicated when associated duodenal or gastric ulcers are present

At one time division of the left phrenic nerve was a popular method of treatment and was not without its successes The elevation and paralysis of the left dome of the diaphragm certainly tended to reduce the hernia and the reflux but was liable to promote lung complications New operations are being described and that of Collis (1957) has had some good results However, it is too early, yet to assess their long term value and there has been insufficient standardization of technique and of selection of patients to allow comparisons between different centres Other operations are undoubtedly on the way One thing is certain—after any operation for reflux oesophagitis there is an appreciable chance of recurrence unless the full regime of management described above is continued The commonest cause of recurrence is failure to prevent the return of obesity

H D J

HIATUS HERNIA AND REFLUX OESOPHAGITIS IN INFANCY

Symptoms may occur in infants and children even from the time of birth Varying degrees of laxity of the oesophageal hiatus permit easy reflux of gastric contents in many small infants and in some permit retraction of the oesophagus and the upper part of the stomach through the hiatus Reflux of gastric contents leads to irritation and ulceration of the lower part of the true oesophagus with haematemesis melaena and spasm of the oesophagus A true stricture of the oesophagus may result from fibrosis

Symptoms

Regurgitant vomiting of mucus or milk may be present from birth especially when the infant is laid flat between feeds Altered or bright blood may be seen in the vomit The vomiting may wax and wane over periods of several weeks In severe cases gain in weight may be inadequate and anaemia may result from the blood loss At the time of weaning to a mixed diet difficulty may be seen in taking solids but many infants show a spontaneous improvement when thickened feeds are given and the infant begins to sit up Rumination is sometimes seen in infants with this condition It is difficult to determine whether the infant suffers pain from the oesophagitis

Diagnosis

When the diagnosis is suspected on clinical grounds it may be confirmed radiologically by screening during a barium swallow The oesophageal reflux and the presence of gastric rugal markings above the diaphragm are diagnostic The infant should always be screened in the Trendelenburg position and while crying as these manoeuvres may enhance the degree of herniation The severity of the oesophagitis may be assessed by oesophagoscopy

Treatment

Even the youngest infants suffering from this condition should be fed while erect and should be propped on pillows between feeds Padded chairs and boxes are used to keep the infant sitting upright Feeds should be thickened with Benger s food or other cereals to make regurgitation more difficult

Many infants lose their symptoms on this treatment and after several months the hernia can no longer be demonstrated radiologically

If symptoms persist over the age of 12–18 months especially with blood in the vomit surgical repair of the hernia should be considered as a true stenosis may develop from the oesophageal irritation Oesophagoscopy yields valuable evidence in making this decision

Anaemia may require treatment with iron or blood transfusion

E W H

SUMMARY OF INDICATIONS FOR OPERATION

The indications for operation in hiatus hernia may be summarized as follows

(1) A primary cause of reflux requiring operation on its own account for example ovarian cyst pyloric stenosis

(2) Severe oesophagitis confirmed by oesophagoscopy and uncontrolled by conservative measures

(3) A hernia enlarging in spite of conservative measures

(4) Oesophagitis with onset of stricture

(5) Oesophagitis with recurrent or uncontrollable anaemia

(6) Associated duodenal ulcer gastric ulcer or ulcer in thoracic stomach or oesophageal ' ulcer

(7) Associated gall stones

(8) Large para oesophageal hernia with danger of strangulation volvulus and so forth

(9) Some infants with symptoms pe sisting after 12–18 months in spite of conservative measures

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CHAPTER 2

PEPTIC ULCER

H DAINTREE JOHNSON

INDICATIONS FOR SURGERY IN PEPTIC ULCER

A PROPORTION of patients with peptic ulcer are unresponsive to medical treatment from the start or soon become so Operation has to be advised for others because cancer cannot be confidently excluded and some are admitted to surgical wards because the ulcer has perforated No controversy arises over the necessity for surgery in all these cases but the decision to advise operation for an apparently uncomplicated peptic ulcer because of the severity and frequency of recurrence of symptoms is not so straightforward Neither is practice standardized in cases complicated by haemorrhage or partial obstruction

The majority of uncomplicated peptic ulcers heal on vigorous medical management but little can be done for the underlying abnormality which is responsible for the tendency often life long to recurrence Commonly the relapses can be terminated only by surgery However in years gone by the danger of a fatal issue deterred the physician from resorting to surgery except in the worst cases and often after the patient had passed through half a lifetime of suffering Such patients were poor surgical risks and the results naturally seemed to confirm the view that operation for peptic ulcer was a dangerous undertaking Nowadays the fatality rate for elective gastrectomies in Great Britain has fallen to around 2–3 per cent Moreover the dangers of dying from one of the complications of a conservatively managed peptic ulcer are not inconsiderable

The General Register Office (1958) has analysed data for the years 1953 1954 and 1955 relating to a 10 per cent sample of discharges from certain hospitals scattered throughout England and Wales and believed to be reasonably representative About half the teaching hospitals and 1 in 6 rising to 1 in 3 of all the Regional Board Hospitals were taking part By multiplying by the appropriate factors it is possible to arrive at an estimate of the total numbers of such discharges for the whole of England and Wales

The number of patients in the enquiry with peptic ulcers admitted from waiting lists and operated on with the fatalities are recorded in Table I This group contains the patients undergoing elective operations, of which the great majority are gastrectomies It is found that planned surgical treatment of peptic ulcer probably costs 470 or so lives in England and Wales per annum But some 5 500 patients are certified as having died from peptic ulcer each year It seems therefore that there are about 5 000 deaths annually from complications occurring while on conservative management or no management at all (about 1 800 of these die in hospital from haemorrhage and 1 200 from perforation) Doll and Avery Jones (1951) have estimated that about 1 500 000 people in England and Wales may have or have had peptic ulcers of which two thirds are active in any one year These figures suggest that on the average a patient with an annually recurring peptic ulcer treated conservatively runs a risk of about 1 per cent of dying of his ulcer in any two year period

Young patients with mild and infrequent symptoms obviously face much less risk than this when managed conservatively but in the older patients with severe symptoms the risk must be greater The hazards associated with surgery also vary with age and other factors However it is evident that nowadays the dangers which result from avoiding surgery compare unfavourably with the risks of operation and these should *in general* no longer weigh against a decision to advise surgery for ulcer disease Indeed if a patient is ready to undergo operation to deter him involves shouldering a grave responsibility

TABLE I

DEATHS FOLLOWING ELECTIVE OPERATIONS FOR DUODENAL OR GASTRIC ULCER, FROM REPRESENTATIVE HOSPITALS (HOSPITAL IN-PATIENT ENQUIRY GENERAL REGISTER OFFICE, 1958)

Age (Years)	*Number of operations*	*Deaths*	*Percentage*
0-24	32	0	0
25-34	169	0	0
35-44	342	3	0 9
45-54	539	11	2 0
55-59	174	6	3 4
60-64	126	6	4 8
65-74	134	8	6 0
75 and over	22	3	13 6
Total	1 538	37	2 4

Advances in surgical technique have also much reduced the incidence of recurrent ulcer and this no longer figures as an important element among the failures of surgical treatment It is the side effects of operation which to some extent mar the results and the value of surgery as a treatment must be assessed as it is bound to be assessed by the patient upon the basis of how the symptoms which occur after operation compare with those which were experienced previously It is for this reason too that the best results are achieved in the worst cases and that operation is not a satisfactory treatment for patients with relatively mild and infrequent symptoms able to be controlled by other methods

After a few years a patient usually establishes a personal pattern of relapses and the longer these have been going on the less likely is the pattern to change for the better Martin and Lewis (1949) found that cessation of these recurrences becomes unusual after 10 years It is not very common even after 5 years and a patient who has manifested regularly relapsing peptic ulcer disease for 5 years or longer should be assessed at intervals as to whether the severity of his symptoms and their duration in each year merit surgical termination He should also be considered from this point of view each time any complication arises In the 15 year follow up of Martin and Lewis one half the perforations and one third of the haemorrhages occurred within 5 years of the onset of ulcer symptoms

As a rough guide 8–12 weeks of ulcer symptoms uncontrolled by simple measures, or the necessity for 4–5 weeks in bed each year should demand consideration of surgery even in the absence of complications

Many other factors must also be put into the balance before deciding whether or not to resort to operation These include the type of ulcer and its position past complications such as perforations haemorrhages or obstructive incidents the age at onset and family history the patient s social status and his occupation his mental make up his domestic responsibilities and finally his age general health and fitness for operation Sound judgment will be impossible without a thorough knowledge of the results which may be expected—good and bad

Type of ulcer

Gastric ulcer

There is always a stronger tendency to advise surgery for gastric than for duodenal ulcers because of the greater age of the patients and the difficulty of being sure when the ulcer is in the stomach that there is no question of malignancy There is also a risk probably between 2 and 5 per cent of malignant change in a gastric ulcer hitherto benign Haemorrhage from gastric ulcers is more frequent than from duodenal ones and when it occurs it is more lethal Though duodenal ulcer is 2–3 times commoner than gastric ulcer the death certification rate from the two diseases is about the same If the diagnoses were correct this would imply that gastric ulcer is a considerably more dangerous disease

The writer has distinguished three different kinds of gastric ulcer (Johnson 1957b) each with a different prognosis and each requiring a different treatment Ulcers of Type I the commonest occur in hyposecreting patients with long sagging stomachs They have a relatively good prognosis from the point of view of complications and respond to recumbency though they are apt to recur when the patient returns to work

Type II is a gastric ulcer which has developed as a complication of a duodenal one usually with pyloric stenosis and acid hypersecretion This ulcer has a bad prognosis is resistant to medical treatment tends to become very large and is prone to bleed Combined ulcer cases form 1 in 10 of all those requiring elective surgery and 1 in 4 of the gastric ones Haemorrhage occurs 4–5 times as frequently in Type II as in Type I ulcers

Type III is the prepyloric or antral ulcer Like duodenal and combined ulcers these occur in hypersecreting individuals Lesions in the antrum not infrequently are found to be neoplastic and some patients with prepyloric ulcers are referred for surgery because cancer cannot be excluded Many others come to emergency surgery as these ulcers are more liable to bleed than those of Type I and of benign gastric ulcers they are the ones which most often perforate Prepyloric ulcers are apt to cause pyloric obstruction and it has been noticed also that ulcers on or near the pylorus are prone to cause symptoms out of proportion to the size of the crater For all these reasons patients with gastric ulcers of Types II and III tend to come early to surgery and only those with Type I are suitable for persevering conservative management It is usual to insist that all gastric ulcers to be treated conservatively shall have been confirmed to be benign by gastroscopy as well as radiology and observed to heal

Though benign Type I ulcers have the best prognosis recurrence or haemorrhage often make surgery advisable for these as well Prepyloric ulcers associated

with a low level of acid secretion and ulcers on or near the greater curvature should be suspected of being carcinomatous

Duodenal ulcer

As duodenal ulcers often begin between the ages of 20 and 40 years it is usual to persevere at first with medical management Moreover duodenal ulcers occasionally show some tendency to improve with advancing age though when they first develop late in life in men characteristically they have a downhill course Duodenal ulcers not infrequently occur first at the menopause in women and many of these also do badly on conservative treatment In the past duodenal ulcer was often described as entirely a medical problem but nowadays though a larger proportion of gastric than of duodenal ulcers come to surgery gastrectomies are performed nearly twice as often for duodenal as for gastric ulcers

Recurrent ulcer

Stomal ulcers recurrent duodenal ulcers and gastric ulcers occurring after gastric surgery all have a bad prognosis They tend to occur in patients with particularly marked ulcer diatheses and complications such as haemorrhage and fistula formation are frequent and dangerous All these lesions should be managed surgically and most will require re operation if the patients are suitably fit

Past complications

Perforation

Most perforation are of duodenal ulcers or the closely related pyloric or pre pyloric lesions After the repair some permanent scarring of this narrow area is inevitable It is not surprising therefore to find that a history of past perforation is common among patients whose duodenal or prepyloric ulcers finally come to elective operation A history of perforation is particularly frequent among patients who later develop pyloric stenosis and among those who get gastric ulcers in addition to their duodenal ones (Johnson 1956)

In a 10 year follow up analysis of nearly 1 000 ulcer patients Moore and his colleagues (1950) found that recurrence of ulcer symptoms after repair of a perforation carried a bad prognosis for in this group 80 per cent had done badly and 16 per cent had died of ulcer complications during the subsequent 5 years These authors considered ulcer relapse after a past perforation to be pre eminent among the criteria for surgery

Haemorrhage

There seems little doubt that a peptic ulcer which has bled before is more likely to bleed again—during any given period of time—than one which has not Every haemorrhage increases the likelihood of yet another and in the old days of continued medical management of repeated haematemeses patients who survived long enough sometimes bled a prodigious number of times Though there is evidence that a second or a third haemorrhage is only slightly more dangerous to life than the first at the same time it is obvious that the more times a patient is allowed to bleed the greater the chance that sooner or later he will succumb

In Moore s analysis 5 5 per cent of those who had had haemorrhages were found to have died of a further bleed or other complication of their ulcers during the subsequent 5 years In a series of 133 patients reported by Avery Jones (1956)

followed 5–15 years after haemorrhage which had recurred in hospital over one third of those treated medically had been since readmitted with further complications and 1 in 10 had died of them In the surgically treated group 2 out of 46 had been readmitted with complications but none had died Moreover, whereas 71 per cent of the group operated on were now symptom free only 20 per cent of the medically managed ones were so About those patients with chronic gastric ulcers who have been in hospital with haemorrhage but have not had emergency operations Avery Jones wrote careful consideration will be given to the need for an elective operation before leaving hospital The general bias is towards more surgery in this group Moore and his colleagues (1950) placed the occurrence of a haemorrhage requiring blood transfusion second among their primary criteria for elective operation Particularly is this so if the ulcer is in the stomach

A patient with pyloric stenosis who has survived a haemorrhage without emergency operation should always have a gastrectomy performed as soon as possible It has been shown that in such cases the ulcer which bleeds is commonly an unsuspected gastric ulcer co existent with but separate from the pyloric lesion (Johnson 1956)

Characteristics of the patient

The symptoms

There is no yardstick by which to estimate precisely the severity of a patient s symptoms but often more can be learned by discovering how much they interfere with his leisure than from their effect on his work attendance Night pain is uncommon in gastric ulcer patients unless a duodenal lesion is also present It is a characteristic feature of duodenal ulcer however and its absence would suggest that the symptoms are not severe Two features which have been shown to be correlated with a bad prognosis are slow response to in patient treatment and epigastric pain which goes through to the back (Dworken and his colleagues 1957)

Age at onset and family history

Moore s analysis revealed that except for those starting after 65 years the earlier the age of onset of ulcer symptoms the worse the prognosis There is a natural and proper reluctance to recommend radical surgery for young subjects particularly if they are likely to get over present anxieties and frustrations and enter a more tranquil phase of life However in an older patient with a long history which began at a young age operation may be considered more certainly necessary A family history of peptic ulcer also implies a poorer chance of improvement without operation There is a tendency for successive generations to develop ulcers at younger ages

Personality

Many patients lose all hope of improvement on a conservative regime and may demand surgery Loss of confidence in medical treatment militates against its success and the patient s own wish for operation should therefore be allowed to weigh in the decision Other patients are incapable because of their mental make up or their occupation of co operating in medical management and attempts to control their disease without surgery may have to be abandoned for this reason The surgeon should beware however of the patient who demands operation for the relief of symptoms which are neither severe nor very prolonged and frequent

and which can be reasonably controlled by regular meals and simple antacid therapy without keeping him away from work Such a patient often imagines that a peptic ulcer can be cut out by the surgeon and his anatomy restored to normal He is liable to complain bitterly when he finds that gastrectomy has left him with side effects—symptoms which a patient who had suffered severely before operation might regard as trivial If the operation and its effects are described to the patients who ask for surgery it is often found that those with mild symptoms change their minds while those with severe symptoms are less easily discouraged

Responsibilities

Avery Jones has remarked that gastrectomy must often be advised to save a man s job If the ulcer is causing absence from work not only may this actually result in dismissal but also the worry that it may do so further aggravates the disease particularly if the patient has a family dependent on him

Present age

From the analysis of gastrectomy deaths taken from the Hospital In Patient Enquiry (General Register Office 1958) and recorded in Table I it can be seen that whereas there is almost no operative mortality up to the age of 45 years after this the curve begins to rise reaching a high level in the elderly The incidence of complications and the danger to life when they occur both also increase with advancing years Peptic ulcer patients who are going to require surgery should therefore if possible undergo operation before old age has added serious hazards to such treatment and before they have reached an age at which they run aug mented risks of fatal complications without surgery as well Every effort should be made to come to a decision before the patient reaches the age of 50 years

As may be judged from Table II an elderly patient with an active peptic ulcer runs greater risks each year from the disease than would a younger one but also there are fewer years left during which to be in danger As age advances there fore the risks associated with an operation approach and probably finally exceed those of dying from the ulcer For this reason patients who have survived to an advanced age without operation should not now be recommended to undergo elective surgery for peptic ulcer unless the position has grown desperate or the patient s life is scarcely worth living The hazards must be faced however when the indications are sufficiently strong and Davey and O Donnell (1956) have been able to report 30 consecutive gastrectomies on patients over the age of 70 years without a death

Cases requiring special caution

The surgeon needs to be particularly on his guard when invited to operate on a patient supposed to have a recalcitrant duodenal ulcer but whose symptoms and history do not seem typical and who has pain which has persisted in spite of bed rest and a strict regime in hospital in fact the diagnosis rests mainly upon the radiological findings Particularly suspect are absence of periodicity throughout the history pain before breakfast and pain which has never been relieved even for a few minutes by food or by alkalis It is also unusual for a patient with duodenal ulcer to show no evidence of nocturnal hypersecretion of acid What has been mistaken in such a patient for a persistent crater in the radiographs sometimes turns out, at operation, to be a diverticulum in relation

followed 5–15 years after haemorrhage which had recurred in hospital over one third of those treated medically had been since readmitted with further complications and 1 in 10 had died of them In the surgically treated group 2 out of 46 had been readmitted with complications but none had died Moreover whereas 71 per cent of the group operated on were now symptom free only 20 per cent of the medically managed ones were so About those patients with chronic gastric ulcers who have been in hospital with haemorrhage but have not had emergency operations Avery Jones wrote careful consideration will be given to the need for an elective operation before leaving hospital The general bias is towards more surgery in this group' Moore and his colleagues (1950) placed the occurrence of a haemorrhage requiring blood transfusion second among their primary criteria for elective operation Particularly is this so if the ulcer is in the stomach

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Peptic ulcer associated with other diseases

Certain diseases *predispose to* peptic ulcer formation and their presence makes persistence or recurrence of ulceration more likely Spinal deformities are liable to promote gastric ulcers for a reason which has been described elsewhere (Johnson 1957a) and this association usually calls for operation though ankylosing spondylitis if it has already materially reduced respiratory excursion may add *prohibitively to the op ration risks*

Gall stones and chronic pancreatitis may either of them be associated with duodenal ulcer Cholelithia is requires cholecystectomy at the same time as gastrectomy and it is probably best to protect the papilla of Vater from acid by making a gastrojejunal rather than a gastroduodenal reconstruction When at *laparotomy there* is evidence of pancreatitis particularly if it is associated with a healed ulcer and the symptoms have been severe and recalcitrant a gastrectomy may not afford relief and a sphincterotomy of the sphincter of Oddi or other procedure should be considered

Hiatus hernia may be found with either a gastric or a duodenal ulcer or both (Johnson 1955) and is an added reason for operation Gastrectomy sometimes cures a hiatus hernia but not invariably so Indeed persistent reflux oesophagitis *may occasionally mar the* results of any gastrectomy

SURGICAL MANAGEMENT OF PEPTIC ULCER

Choice of operation

Th objects of surgery are not the same for every peptic ulcer, and it is unsound to perform a standard procedure *in all cases*

In patients with duodenal prepyloric *or combined* duodenal and gastric ulcers associated with acid hypers *cretion the* aims of the operation are twofold to eradicate the narrowed damaged segment of bowel and to prevent recurrence of ulceration by adequately undermining acid secretion For this ablation of no more than the antrum (*the main* source of gastrin) is ineffectual and a substantial proportion of the acid secreting body of the *stomach* must also be sacrificed

A two-thirds resection is recommended followed by a Polya Hoffmeister or Lahey gastrojejunal anastomosis *Many surgeons* have reported on the excellent protection against recurrence afforded by the addition of vagotomy to gastrectomy (Farmer and his colleagues 1951 *Harkins* and his colleagues 1953) and more moderate resection has been shown to be adequate when the vagi are also divided (Johnson and Orr 1954) However the vagotomy increases the incidence of side effects and it is good policy to reserve the combined *operation* for the grosser over secretors of acid

A few surgeons have reverted to the Billroth I operation for duodenal *ulcers as well* as for gastric ulcers However though the resection when properly performed can be just as radical as in any other kind of gastrectomy it has too often been followed by recurrence when used in hypersecreting *subjects* and cannot be recommended—*at least* not without the addition of vagotomy

Gastroenterostomy plus vagotomy fails to cure peptic ulcer disease for long in some 10 per cent of patients but is a useful manoeuvre for difficult or poor risk patients with active irremovable duodenal ulcers Gastroenterostomy alone still has a place for the occasional elderly and frail patient with pyloric stenosis and a long since healed ulcer

Four out of five gastric ulcers are associated with hyposecretion Recurrence of ulceration does not occur in this group and there is no reason for resecting a

to a healed, scarred ulcer The patient may not be relieved by gastrectomy if *some other co existent lesion such as chronic pancreatitis or even constipation* was the cause of the present symptoms The surgeon should also beware of accept ing the diagnosis of chronic peptic ulcer when the symptoms are atypical and a haematemesis has been the chief support for the diagnosis for acute ulcers which bleed can complicate almost any disease—or even be caused by taking aspirin

TABLE II

ESTIMATED MORTALITY AMONG ULCER PATIENTS BY AGE GROUPS COMPARED WITH MORTALITY FROM ALL CAUSES IN WHOLE POPULATION

Age groups	*Estimated incidence of peptic ulcer active within 1 year in males per cent (Doll and Jones 1951)*	*Male population England and Wales—1 000 1950*	*Estimated male ulcer population —1 000 1950*	*Number of deaths assigned to gastric and duodenal ulcer 1950*			*Ulcer death rate per annum per estimated 100 male patients with active ulcers*	*Death rate all causes per cent of population 1950*	*Estimated death rate all causes per cent of ulcer patients 1950*
				G U	*D U*	*G U or D U*			
20-24	2 3	**1 486**	34	**4**	**10**	**14**	0 04	**0 14**	0 18
25-34	2 7	**3 188**	86	**27**	**54**	**81**	0 09	**0 17**	0 26
35-44	4 9	**3 381**	166	**134**	**166**	**300**	0 18	**0 29**	0 46
45-54	6 0	**2 822**	169	**302**	**377**	**679**	0 40	**0 83**	1 2
55-64	5 0	**2 038**	102	**573**	**476**	**1,049**	1 0	**2 2**	3 2
65 & over	4 5	**1 990**	90	**990**	**763**	**1,753**	1 9	**7 9**	9 7

It is emphasized that this Table is not a statistical analysis of facts but mainly a Table of estimates based partly on fact and partly on limited observation and extrapolation Conclusions of only limited value may therefore be drawn from them

The probability that ulcer patients have altered susceptibility to other diseases has been neglected and ulcer patients assumed to have death rates from other causes similar to those of the rest of the community (estimated figures in less bold type)

On the other hand a patient with a typical history and symptoms merits a laparotomy, provided the symptoms are severe enough even though the radio graphic examination is negative On one occasion the writer encountered such a patient with an ulcer crater so large that it had been mistaken for the whole of the duodenal cap in the radiographs In 3 patients ulcers were found in the second part of the duodenum In 4 others craters on the posterior wall of the duodenum and 7 on the posterior wall of the stomach had failed to reveal them selves at radiological examination but were found at laparotomy Whitby (1958) reported that of the patients referred by him to hospital with ulcer like dyspepsia 27 had negative x rays In 5 of these however the presence of ulcers was proved by some complication such as perforation or by further investigation shortly afterwards

of faintness and palpitations lasting for perhaps 10 minutes This is particularly liable to come on if the meal contains a lot of sugar It will quickly pass off if you lie down and it is not in any way dangerous

At first it may not be possible for you to eat enough if you take one main meal and several small ones each day In order to keep up your nourishment you may have to eat more at the smaller meals and you should take a glass of milk and some biscuits or sandwiches between meals and last thing at night Do not fill yourself up with greens and fruit for though you need a little each day for the sake of vitamins you are no better off with a lot and they do not contain much nourishment Take plenty of milk butter and cream and do not be afraid of meat Avoid only an excess of greasy fried food

Take tea or coffee weak and in moderation only Do not drink at all with your main meals in order to leave more room for food You should not drink spirits at all but you may drink the occasional half pint of beer if you want to You have a better chance of avoiding further trouble if you do not smoke

Your ability to absorb certain essentials from your diet may be diminished and these have to be taken in the form of pills For example anaemia sometimes develops gradually several years after this operation unless tablets containing iron are taken regularly in the dose prescribed by your doctor You should therefore go to see your doctor once every 12 months to make sure you are not becoming anaemic He will tell you whether you need to attend hospital for a blood examination and will give you such medicine as he finds to have become necessary

If you develop any new symptom you should consult your own doctor who will tell you whether it is anything to do with your old trouble or your operation and will tell you if you should attend hospital You should anyway go and see him 3–6 months after your operation to give him the opportunity to assess your result

When you cease attending hospital you will receive a follow up form once every 12 months Please be sure to fill this up and return it Only thus can we learn if the particular kind of gastrectomy which had to be done in your case is turning out less or more satisfactory than others and so try to select the more successful kind whenever possible for other patients in the future

It is a necessary precaution to prescribe extra vitamin B and iron to be taken for the rest of the patient s life Two tablets of ferrous sulphate compound and one tablet of aneurine compound per day are recommended and they become more rather than less important as the years pass

Results side-effects and late complications of gastrectomy

Few operations have achieved greater success in the control of any disease than has gastrectomy for peptic ulcer and it is usually considered that some 85 per cent of patients have eminently satisfactory results The consequent popularity and increasing use of the operation have been followed in recent times by greater awareness of its occasional unpleasant side effects Let it first be emphasized therefore that very few patients would choose to return to their former ulcer symptoms rather than continue to tolerate their post gastrectomy ones When 837 gastrectomized patients were asked whether they considered their operations to have been worth while 98 4 per cent replied that they did consider them so and would indeed have undergone gastrectomy just the same if they had known in advance exactly what their results would be (Johnson and Orr 1954)

Reviewing 151 patients 23–50 years after gastrectomy Krause (1958) found that the majority spontaneously expressed satisfaction with their results and all had been wholly fit for work most of their lives since operation

The frequency and troublesomeness of side-effects after gastrectomy depend partly upon the functional and mental make up of the patient and partly upon the extent and complexity of the surgical interference Whereas a moderate resection for gastric ulcer followed by gastroduodenal anastomosis does not

large area of gastric mucosa The most moderate gastrectomy compatible with removal of the ulcer is the right procedure for these patients and a Billroth I gastroduodenal anastomosis is held to achieve the best symptomatic results

Stomal ulcer developing after Billroth I gastrectomy should be treated by conversion to a Polya type of anastomosis and vagotomy Gastric ulcer occurring after a previous Billroth I requires further resection of stomach wall followed by gastrojejunal anastomosis No vagotomy need be added to what is now a high resection Stomal ulcer following a gastroenterostomy is best treated by a Polya or Lahey gastrectomy and vagotomy though vagotomy alone may be given a chance if the patient is not fit for more extensive surgery Stomal ulcer occurring after Polya gastrectomy may be treated by vagotomy alone, though local resection of the diseased segment of jejunum and refashioning of the stoma is often performed as well in a fit patient

Operative mortality

In centres with plentiful staff experienced in gastric surgery the overall mortality of gastrectomy is under 2 per cent and the death of a patient below the age of 60 years is rare Under staffed under equipped hospitals cannot hope to reach such standards and others do less well because they have to attempt the salvage of a large proportion of elderly patients with grossly advanced ill managed lesions

During the years 1946–50 details were collected concerning 3 167 elective gas trectomies performed at 10 hospitals 3 large and 3 small provincial ones 2 county council hospitals and 2 teaching hospitals The overall mortality was 4 per cent and varied from 1 3 per cent of deaths among 680 patients from one hospital to 11 deaths among 96 patients from another Since then there may have been some improvement for in the Hospital In Patient Enquiry (General Register Office, 1958) there were 1 538 elective operations for peptic ulcer (pre sumably mostly gastrectomies) with a fatality rate of 2 4 per cent These deaths are recorded, with an analysis by age groups in Table I

Convalescence and the management of post gastrectomy life

A stay in hospital of 12–14 days after operation is usually adequate in the absence of complications After discharge older patients need 4–6 weeks conva lescence but a young subject operated on for a duodenal ulcer will often press to be allowed to return to work after 2–3 weeks and to insist on his being idle for longer will probably do more harm than good

Hernia of the scar may follow post operative infection of the wound but when healing has been clean no harm comes from reasonable exertion indeed exercise of the abdominal muscles is desirable A patient who has had a badly infected wound is fitted with an abdominal belt before discharge Patients whose wounds have healed normally are allowed to do what they find they can manage and timid ones are urged to exercise

Patients are less likely to be disappointed with the results if the effects of gastrectomy are explained to them in advance and they are warned that minor restrictions may be necessary The following instruction sheet is issued to the writer s patients after gastrectomy with gratifying effect

> The operation which has been performed for the cure of your peptic ulcer is called a gastrectomy After it your stomach (that is the bag like part of your gut into which your food goes when you take a meal) is smaller than it used to be You will find at first that you cannot take very much at a time without feeling a bit blown out If you do in fact take too much all that may happen is that you may have an attack

within 10 minutes of a meal This implies that the stomach must already have become empty of food The bilious vomit is preceded by nausea and sometimes by colic both of which it relieves Some 5 per cent of the writer s patients have complained of this symptom and a further 11 per cent have experienced it occasionally It has been most frequent after a Polya type of operation a left to right jejunal loop (Lahey) has carried a lower incidence and the Billroth I operation has achieved the best results

Wells and MacPhee (1952) described a separate variety which they call the afferent loop syndrome They believed it to be due to distension with bile of an afferent loop which has become kinked where it meets the stomach the vomit occurring when pressure finally overcomes the obstruction and the loop has emptied into the gastric remnant

No treatment is dependable for the control of bilious vomiting but many patients are improved by reducing their fat intake The writer has cured the vomiting in 3 patients by cholecystectomy but in a fourth the attacks began again after 3 months Another has developed the symptom in spite of an earlier removal of the gall bladder Sometimes olive oil taken before meals will cause the bile to arrive in the stomach at the same time as the food instead of after it and will control this symptom

Diarrhoea

Attacks of diarrhoea are an uncommon sequel to gastrectomy but may prove recalcitrant to treatment The incidence of these attacks is higher among patients who have had very radical resections (Johnson 1954) and it is less uncommon too among patients who have also had a vagotomy performed After vagotomy however the attacks of diarrhoea tend to subside in 1-2 months though in one of the writer s patients they continued for nearly 2 years Post gastrectomy diarrhoea may respond to simple kaolin or chalk mixtures or to methyl cellulose and dilute hydrochloric acid has occasionally proved useful Stubborn attacks should be treated with phthalyl sulphathiazole

Some patients observe no change in their bowel habits after operation but after gastrectomy some and after vagotomy most notice increased regularity Vagotomy sensitizes the bowel to purgatives and to certain items of diet notably onions and rhubarb which may have to be avoided

Asthenia and deficiency disorders

Sometimes a patient s only complaint after gastrectomy is of failure to recover normal vitality A short course of testosterone may relieve this symptom to some extent in males Anaemia must be watched for particularly in women for it may develop insidiously after several years In his very long term survey Krause (1958) found that about one third of the patients who had had no prophylactic iron therapy had become anaemic many grossly so The anaemia is of the simpl iron deficiency variety and responds to ferrous sulphate or gluconate Macrocytic anaemia has been described from time to time but is very rare Vitamin B deficiency is also occasionally seen and is likewise easily controlled

Recurrent ulceration

Recurrence is rare after gastrectomy for gastric ulcer but may follow operations for duodenal ulcer It was becoming so frequent after gastroenterostomy that the operation has been almost abandoned After hemigastrectomy Reinhoff (1945)

often leave the patient feeling a lot different from normal, a very radical Polya type of operation is as like as not to result in post prandial symptoms particularly in an anxious patient

The most frequent symptoms are dumping' bilious regurgitation abdominal colic, asthenia, and inability to eat enough to maintain bodyweight

Dumping

Gastrectomy of any kind reduces gastric capacity and seriously interferes with the mechanism of emptying The result is rapid and sometimes precipitate gastric evacuation, in fact in some cases a whole meal may be dumped into the small bowel within a few minutes The proportion of patients who suffer from symptoms as a result has been variously reported to be from 3 to 75 per cent, depending to some extent upon the kind of gastrectomy used but much more upon the criteria accepted by the observer as qualifying patients as dumpers, for the frequency and severity of attacks varies so much from case to case A few patients have an attack after every meal but most have only one or two in a week and many experience no more than two or three in years Of 538 patients operated on by the writer for peptic ulcer 9 per cent had a dumping attack once a week or more for the first year or so and 16 per cent admitted to occasional or slight symptoms Krause (1958) reported that of patients reviewed 23–50 years after gastrectomy 68 per cent were altogether free from post prandial symptoms and none at all still experienced bad or frequent attacks There is no doubt that these symptoms improve in time though in the worst cases they may persist for several years

Incidents usually begin when a return is made to full diet but occasionally the first attack is experienced months or rarely even years after operation The symptoms may come on immediately after eating or be delayed for half an hour or an hour They usually clear up in 10–20 minutes The symptoms experienced are partly abdominal and partly cardiovascular The patient may have colic but more often he is aware of painless churning intestinal activity Simultaneously the pulse rate and blood pressure rise a few points the patient becomes pale and feels hot In a bad attack he is then so overwhelmed with fatigue that he feels compelled to lie down A few patients are liable to have diarrhoea after an attack

Some patients describe rather similar attacks occurring 2 hours or more after food and associated with profuse sweating These are due to hypoglycaemia and are relieved by sugar or boiled sweets They were common after vagotomy when that operation was used alone but are only a little more frequent after gastrectomy plus vagotomy than after gastric resection alone It may be that they are related to the loss of vagus nerve supply to the pancreas which results from either operation

THE MANAGEMENT OF DUMPING —A bad attack of dumping may be relieved by lying down and patients should be advised to avoid exercise after food Meals should be small frequent and of even size They should be eaten slowly and taken dry and should contain a minimum of soluble material of high osmotic value, such as sugar or protein hydrolysate Many patients find that milk particularly if sweetened will bring on an attack A high protein diet is advised and olive oil before meals is sometimes helpful Banthine suits some patients and others report good results with alcohol

Bilious regurgitation

The vomiting of bile is a remarkable post gastrectomy phenomenon for in the worst cases as much as half a cupful of bile unmixed with food may be returned

(3) An attack of pyloric obstruction requiring hospital admission Add 1 point

(4) A duodenal ulcer beginning before the age of 20 years or after 60 years in a male Add 1 point

(5) A prepyloric ulcer or combined duodenal and gastric ulcers Add 1 point

(6) Regularly relapsing symptoms occurring 6 or more weeks each year add 1 point for each 5 years or 12 or more weeks each year add 1 point for each 2 years or 24 or more weeks each year add 1 point for each year

Two points calls for a consultant opinion and operation is likely to be recommended in many cases

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reported 8 per cent of proven recurrences With two thirds resection the rate is probably not above 2–3 per cent, and when vagotomy has been added the figures may be as low as 1 per cent or less

A recurrent ulcer is suspected if the patient complains of pain similar to that which he experienced before his operation coming on after a period of freedom Colicky pain after food is occasionally complained of following gastric surgery but this pain is not like ulcer pain relieved by more food or by antacids it usually lasts only a short while and is sometimes relieved by belching Response to milk and to alcohol should be observed Pain which occurs after the former but not after the latter is not due to a recurrent ulcer but may be a symptom of dumping ' Recurrent ulcers have a bad prognosis and further surgery such as vagotomy is usually the best treatment It is important to bear in mind that in a long term sense gastric carcinoma in the stomach remnant is commoner than jejunal ulcer and should always be suspected if symptoms recur after an interval of many years

Susceptibility to other diseases after gastrectomy for peptic ulcer

Krause (1958) has reviewed the sequelae of 361 gastrectomies performed 23–50 years previously Comparing the actual mortality with that which would have been expected on the basis of the ages and sexes of the patients and the averages for the community, he found it to be significantly higher for the gastrectomized subjects No comparison could be made with ulcer patients not operated on whose death rate would probably have been higher still

Deaths from tuberculosis had been nearly three times more frequent than among similar age groups in the community as a whole and although Boman (1955–56) observed that peptic ulcer patients have an increased susceptibility to tuberculosis he held that gastrectomy had augmented this further However Thorn Brookes and Waterhouse (1956) stated that the increased incidence after gastrectomy is entirely among the patients with severe ulceration who had lost much weight before operation Carcinoma of the gastric remnant had been the cause of 25 deaths—twice the expected number and five times as many as those caused by benign stomal ulcers though on the average death from carcinoma occurred 24 years after the gastrectomy for peptic ulcer

SUMMARY OF INDICATIONS FOR ELECTIVE OPERATION IN PEPTIC ULCER

Absolute indications

(1) A gastric ulcer when carcinoma cannot be excluded with certainty

(2) A peptic ulcer which has been altogether recalcitrant to medical treatment from the start or has become so

(3) A chronic gastric ulcer which has twice bled requiring blood transfusion

(4) A chronic peptic ulcer of the stomach duodenum or jejunum which has appeared or recurred after previous surgery

(5) Organic pyloric stenosis

(6) Hourglass deformity of the stomach

(7) A peptic ulcer associated with a hiatus hernia with gall stones or with chronic pancreatitis

(8) A chronic gastric ulcer caused by a spinal deformity

Relative indications

(1) A recurrence of symptoms after earlier perforation Add 1 point

(2) A haemorrhage requiring blood transfusion Add 1 point

results in improved cardiac filling and stroke volume and a minute output 2 or 3 times the normal resting amount Though raised venous pressure is ordinarily a sign of cardiac failure Howarth and Sharpey Schafer indicated that it may well be a physiological reaction in these cases This hyperkinetic phase is a dangerous one for even the small further increase of venous pressure produced by transfusion may upset the precarious balance and cause a decrease in cardiac output as in Starling s overloaded heart lung preparation (Starling 1918) Heart failure will then follow

Clinical assessment of blood loss

If less than one fifth or so of the blood volume has been lost and haemorrhage has ceased the patient particularly if young may seem deceptively fit If there is a history which suggests a considerable loss of blood and the patient has been temporarily unconscious it may be that the fainting represented a vasovagal reaction during which bleeding stopped and since when some restoration of blood volume has occurred Such a patient may become shocked ' after a surprisingly small further loss A patient seen during the vasovagal phenomenon has a low arterial pressure but a slow pulse Confirmation may be obtained by lowering the patient s head which leads to rapid improvement unless haemorrhage is continuing (Grant and Reeve 1951)

The full picture of shock a pale cold clammy patient with a rapid thready pulse implies a substantial bleed—probably not less than 2 1 and often much more particularly if the bleeding has been intermittent or relatively slow as in many haemorrhages of gastroduodenal origin The perilous hyperkinetic state is manifested clinically by a rapid bounding pulse with almost normal systolic but low diastolic pressure the skin is warm and dry and peripheral circulation is good although the face is pale and the patient looks ill With the patient propped up jugular filling may be observed (Howarth and Sharpey Schafer, 1947)

Individual features are none of them dependably related to proportions of blood lost but a systolic blood pressure of 100 mm Hg often corresponds to a blood volume 70 per cent or less of normal (Grant and Reeve 1951) Tibbs (1956) reported the diastolic pressure to reflect diminution of blood volume more reliably than systolic pressure but warned of the marked reluctance in hypertensive patients for the blood pressures to drop as they do in other people A diastolic pressure under 60–65 mm Hg was considered to indicate a moderate to severe haemor rhage

Though a fast pulse rate is suggestive of substantial blood loss a slow one is not necessarily reassuring and it is as a chart of progress that the pulse rate has its greatest value Tibbs found the colour of the hands to be a useful guide a waxen appearance with ivory like nails and dark constricted veins being seen to accompany a heavy loss and cyanosis being particularly ominous Sweating indi cated a state of decompensated hypovolaemia or concurrent haemorrhage and the onset of sweating while under treatment meant a recurrence of bleeding

Investigations

Grant and Reeve (1951) wrote It has often been stated that haemoglobin estimations made in the first few hours after haemorrhage are of no use in estimat ing the amount of blood lost This is not true These authors found that in fit soldiers haemoglobin concentration might fall below 75 per cent within 3 hours of wounding when more than 40 per cent of the blood volume had been shed

CHAPTER 3

URGENT COMPLICATIONS OF PEPTIC ULCER

H DAINTREE JOHNSON

HAEMATEMESIS AND MELAENA

Physiological effects of haemorrhage

A HEALTHY young person can sustain a sudden and substantial loss of blood without any striking ill effect The diminished venous pressure at the heart may lead to a fall in cardiac output, despite some acceleration of the pulse However, blood pressure is maintained by arteriolar constriction But this further hinders venous return and when blood loss reaches a critical point, sometimes under 500 ml but often about 1,500 ml, the body reacts by a sudden dilatation of arterioles in muscles Venous return is thus facilitated but at the cost of a marked fall in arterial pressure and the patient may faint This vasovagal reaction is accompanied by slowing of the pulse—a feature by which it may be recognized If bleeding continues the full state of shock develops and the blood pressure is now low in spite of vasoconstriction The pulse is rapid and sweating betokens sympathetic stimulation

Diminished capillary pressure causes tissue fluids to enter the blood stream to some extent restoring the blood volume, but at the same time diluting the remaining blood The osmotic pressure of the plasma proteins is thereby reduced and the rate of restoration of blood volume becomes slower It might stop far short of complete replacement were it not for the fact that though at first only water and electrolytes are transferred from the tissues to the circulation soon proteins are mobilized as well, and the fluid which is added resembles weak plasma In the first 12 hours after a severe haemorrhage as much as a litre of fluid may enter the blood stream but even if no further bleeding takes place 3 or 4 days may pass before the blood volume is back to near normal

Though plasma proteins may be restored in a few days many weeks may be required for the replacement of red cells and haemoglobin In cases of massive and continued bleeding the full maintenance of blood volume could therefore result in such gross dilution of haemoglobin that minimum oxygen requirement could be delivered only if very large volumes of the anaemic blood were carried around the body This would demand a vastly increased circulation rate and cardiac output Such complete haemodilution does not, in fact occur Instead incomplete restoration of blood volume leads to a progressive fall and as shown by McMichael and his colleagues (1943) in gross anaemia from bleeding it may be reduced to one half or even one third of the normal The capacity of the vascular bed may be matched to the diminished blood volume partly by constriction of the great veins (Silfverskiold 1946)

Howarth and Sharpey Schafer (1947) have shown that in severe anaemia new cardiovascular adjustments also occur to achieve the necessary increase in cardiac output As well as a rapid pulse rate there is increased venous pressure which

results in improved cardiac filling and stroke volume and a minute output 2 or 3 times the normal resting amount Though raised venous pressure is ordinarily a sign of cardiac failure Howarth and Sharpey Schafer indicated that it may well be a physiological reaction in these cases This hyperkinetic phase is a dangerous one, for even the small further increase of venous pressure produced by transfusion may upset the precarious balance and cause a decrease in cardiac output as in Starling s overloaded heart lung preparation (Starling 1918) Heart failure will then follow

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though it is possible that haemodilution may sometimes be slower in older and particularly in dehydrated subjects A haemoglobin concentration of 50 or 60 per cent or even less is not uncommon after gastroduodenal haemorrhage A low level of haemoglobin may either indicate very heavy recent loss or that the recent bleed was superimposed on a pre existing chronic anaemia In judging whether the present or previous blood loss predominates, the haematologist is guided by the appearance of the blood film the size of the red cells the presence of reticu locytes the white cell count, the haematocrit and the serum iron content Clinical assessment may be based upon a comparison of the haematocrit or, less depend ably the haemoglobin concentration and the physical signs

Tibbs (1956) found the plasma protein content to be a better guide than the haemoglobin to diminution of blood volume in gastroduodenal haemorrhage, a figure of under 6 g per cent usually indicating substantial depletion Costello (1946) came to similar conclusions

The blood urea tends to be raised after gastroduodenal haemorrhage for several reasons Diminished glomerular filtration in the presence of renal ischaemia, effects of dehydration and sometimes starvation, and the absorption of nitro genous products of digestion of blood in the bowel all contribute, but there is no way of knowing to what extent each has been responsible It is important to remember that prolonged hypotension may lead to fatal acute tubular necrosis of the kidneys, and a high level of blood urea is often ominous

Treatment

Whatever policy is adopted in regard to the use of surgery in gastroduodenal haemorrhage, replacement of lost blood by transfusion is the mainstay of treat ment At one time it was held that transfusion might increase the likelihood of recurrent haemorrhage and some clinicians used to withhold it or use it very sparingly in the belief that the patient would thus be given a better chance of survival Since even without transfusion haemorrhage all too often recurs and since such recurrence is then liable to be fatal it is now generally realized that it is much safer for the patient to face the risks of fresh bleeding after restoration of the depleted store of blood, than to face them in a continued state of exsanguina tion Moreover Avery Jones (1947) has shown that transfusion does not in fact, increase the chance of further haemorrhage

In a certain number of elderly and very anaemic patients, particularly those in the hyperkinetic state of Howarth and Sharpey Schafer transfusion may precipi tate heart failure Clinicians are understandably reluctant to risk treatment which can itself prove lethal even though the dangers may be less than those of the condition for which it is given Indeed fear of such an outcome has undoubtedly often deterred the clinician from giving blood as fast as it could have been accepted or even sometimes as fast as it was being shed into the bowel Firt and Hejhal (1957) considered that many more lives are lost from blood being given in too small amounts and too slowly than are lost from heart failure, most surgeons aware as they are of the urgency of blood replacement would agree with them Shocked patients need blood urgently lest vital tissues suffer irreversible damage For the first bottle or two a rate of 100 ml per minute or more is aimed at Tibbs recommended the maintenance of a high rate until the pulse rate falls to below 100 per minute, the systolic blood pressure is restored to at least 110 mm Hg the diastolic blood pressure to at least 75 mm Hg and the hands have recovered a good colour If this rate should be faster than can be dealt with by the patient s

heart the venous pressure will rise he should therefore be kept propped up so that the jugular veins may be watched This is also the position in which heart failure is least likely to develop

Intra arterial transfusion was recommended for patients whose hearts cannot accept transfusion intravenously on the grounds that by raising arterial pressure coronary circulation may be increased and the condition of the myocardium improved It is dangerous and illogical however to raise aortic pressure artifici ally when the heart is on the verge of failure and the method is long since discred ited Firt and Hejhal (1957) adduced evidence that benefit reported to have been observed when this method was used was due to the diminished proportion of citrate reaching the heart for citrate is toxic to cardiac muscle and depresses the sinus reflex (Heymans and Verstraete 1948) Firt and Hejhal also recommended the administration of calcium gluconate intravenously into a different limb to counteract the effects of the citrate when large or rapid transfusions are used

If a very anaemic patient is suspected of being in the hyperkinetic state or the jugular pressure is seen to rise a slow transfusion of packed cells is the most that may be given

Adequate fluids are indicated and frequent feeding of a soft diet of high protein content to buffer the acid gastric juice and to provide the patient with the essentials for blood replacement though some clinicians like to aspirate the stomach at intervals by indwelling tube to keep it free from digestive juice and as a check on recurrence of bleeding

Indications for operation

Attention has been drawn in recent years to the much increased risk of dying from a conservatively managed haemorrhage occurring late in life and from haemorrhage which recurs after admission to hospital On the basis of these observations it has been advised—and the criterion is widely followed—that a patient over the age of 40 or 45 years who continues to bleed or bleeds again after the institution of medical treatment should undergo immediate operation (Avery Jones 1947 Bohn 1949 Pedersen 1951 Begtrup 1951) It is not the writer s view however that there is any age before which medical treatment and after which surgical treatment is the saf r for operation also carries greater risks in the elderly and is correspondingly free from risk in the young fit patient Indeed Avery Jones (1956) recorded that the more frequent recourse to surgery which he had recommended led to improved survival figures only among those under the age of 60 years

Surgery will always carry a high mortality where patients are referred for opera tion only when all hope of saving life without it has been abandoned But evidence is accumulating that adequate blood transfusion for haematemesis plus early operation is the safest treatment of all particularly if the risks associated with later elective operation after successful conservative management as well as the dangers of further complications are taken into consideration Among the 10 per cent sample of discharges referred to on page 8 (General Register Office 1958) there were 2 606 cases of haemorrhage from peptic ulcers At the Teaching Hospitals 38 per cent of 484 patients were operated on and there was an overall fatality rate of 4 3 per cent At the Regional Hospital Board hospitals only 28 per cent of the 2,122 patients were operated on and the overall fatality rate was 5 6 per cent

Rosanov (1951) reviewing 1 438 cases found that in 677 in whom conservative management was adopted the fatality rate was 22 1 per cent Partial gastrectomy

had been performed in 723 with 12 per cent of deaths but of these, 73 had been 'last resort operations and had cost 38 3 per cent of fatalities, 272 operations took place after periods of medical management and 11 7 per cent of these patients died some were admitted to surgical wards in the first place and 125 of these were operated on all within 24 hours of the onset of haemorrhage There was only 1 death

Ogilvie, Cardoe and Bentley (1952) reported on the management of 358 cases with an overall mortality of only 5 per cent Their policy was to operate if haemorrhage continued longer than 24 hours without regard to age or length of history

Fraenkel and Truelove (1955) had a mortality of 5 6 per cent during the previous 5 years and found this rate to be only half as high as during the previous 10 years *They attributed the improvement largely to the more frequent use of* surgery They also held age to be unimportant as a criterion for operation except in doubtful cases when they considered that the older patients should be operated on Of the 258 patients in this series 53 who had not had emergency operations had already required interval surgery within 1–5 years of their haemorrhages Tanner (1950) after trying various policies in the management of haematemesis, found that he had achieved his best survival rate when he had operated on 60 per cent of his patients

Before deciding to resort to operation it is necessary to satisfy oneself that the patient has indeed got a chronic peptic ulcer For although 90 per cent of gastro duodenal haemorrhages arise from peptic ulcers nearly one third of these are *of very recent origin and seldom require surgery Of the less common sources,* oesophageal varices (*see* Chapter 10) and gastric neoplasms form the bulk the remaining few being due to hiatus hernias blood disorders and so forth

If it is decided that a chronic ulcer is indeed present one should ask oneself the following question "Assuming that the patient recovers completely from the present incident will he then have sufficient indications for elective gastrectomy? If so then the patient should undergo emergency operation for the present condition as soon as he has been made fit for it, and without waiting for a recurrence of bleeding If there is any doubt a patient over the age of 45 years should be operated on

The following special indications also call for emergency operation forthwith or as soon as possible (1) simultaneous haemorrhage and perforation, (2) haemorrhage in a patient who is recovering from the repair of a perforation, *(3) haemorrhage in a patient known to have both a duodenal ulcer and gastric* ulcer or with pyloric stenosis if dehydration and alkalosis are under control, (4) a severe haemorrhage in a patient with a known gastric ulcer and (5) continuance of pain after a haemorrhage from a chronic ulcer

Most surgeons consider that as long as the patient is still improving on transfusion the time has not yet come for the operation but as soon as improvement *ceases or evidence of fresh bleeding appears he should be taken at once to the* operating theatre Others prefer to begin resuscitation by rapid transfusion in the theatre and proceed with operation as soon as possible holding that in the worst cases little improvement can be hoped for until the bleeding is under control

If it is not considered that the indications for interval surgery will have been fulfilled after recovery and none of the above indications applies then emergency operation is not planned but is held in reserve for use only if conservative methods fail In older patients continuance of bleeding for over 24 hours or the onset of a second haemorrhage is considered to spell such failure In younger patients transfusion may be persevered with as long as practicable

If fresh bleeding is to be the signal for operation it is essential that definite instructions to this effect be given to resident staff lest in the event fatal delay should occur and it is partly for this reason that some hold that patients who bleed are safest managed in a surgical ward from the start

A patient who has had a small haemorrhage before admission but has no clinical evidence of this on arrival at hospital should be judged in the same way as one who has recovered with transfusion

Inability to obtain enough blood of a rare group or a difficult one such as O Rh negative is an occasional reason for having to resort sooner to operation and the total strain on supplies of blood is a reason for a general policy of earlier surgery

Contraindications to operation

Haemorrhage from either an acute or a chronic peptic ulcer not uncommonly complicates other illness and may possibly also be promoted by treatments such as the administration of corticosteroids aspirin and stimulant expectorant mixtures by the wearing of tight surgical belts and by thoracodorsal sympathectomy A haematemesis has often been a terminal event in uraemia bronchial carcinoma pulmonary tuberculosis and many other diseases If a patient with a concomitant disorder is so ill from it as to be nearly moribund evidently surgery cannot be considered Such a patient is also in much graver danger of succumbing to his haemorrhage without surgery and this must also be taken into account when deciding upon the safest course

PERFORATION

Perforation is responsible for nearly one third of the deaths from peptic ulcer in Great Britain The most important factors predisposing to a fatal issue are the age of the patient and the length of time which elapses between the perforation and operative treatment Housemen should bear in mind that it is notoriously dangerous for a patient to perforate while under treatment in a medical ward as the patient there who complains of pain is liable to be judged to have a simple exacerbation of his ulcer distress and not to be examined Perforation should be particularly watched for in patients under treatment with corticosteroids

The fatality rate from perforation has fallen in recent years but still stands at about 12 per cent (General Register Office 1958)

Treatment

An acute perforation of a peptic ulcer is an indication for urgent admission to a surgical ward but three different methods of treatment are in vogue The usual one is prompt repair of the leak although Hermon Taylor has claimed good results using a non operative technique of management (Taylor 1951 Taylor and Warren 1956) Other surgeons have urged immediate gastrectomy for many cases (Moore and his colleagues 1954) A patient with a perforated and inflamed ulcer is not a suitable subject for an inexperienced or occasional gastrectomist nor can the conservative method of management be recommended except for those specially trained in its use and prepared to give much time and attention to it For the resident surgical officer simple repair is the right choice for the ordinary case of perforated duodenal ulcer in a young patient

The special indications for immediate gastrectomy are as follows (1) associated perforation and haemorrhage (2) associated perforation and pyloric obstruction,

(3) an enormous perforation where gastrectomy may be technically less difficult and safer than repair, (4) a perforated gastric ulcer in a patient over the age of 45 years if features suggesting malignancy are present (5) if all of the following conditions are fulfilled (*a*) a reasonably experienced surgeon is available (*b*) the indications for interval gastrectomy would be considered to be present should the patient recover from the perforation, (*c*) not more than 6 hours has elapsed since perforation, (*d*) the technical difficulties due to the activity of the ulcer are not excessive (*e*) surgical shock is under control, and the patient's age and general condition do not contraindicate the longer operation

Gastrectomy is not justifiable for perforated acute ulcers It is a wise precaution *always to perform a biopsy on a perforated gastric ulcer if it is not resected*

Conservative management with continuous gastric suction intravenous infusion and antibiotics should be used for an elderly patient who is too ill to be given an anaesthetic, or when no surgeon is available It may also be used when the diagnosis is beyond doubt the perforation is thought to be of an acute ulcer and definite clinical improvement suggests that the leak has become sealed off (*see* Taylor and Warren 1956)

PYLORIC STENOSIS

Some degree of gastric retention is usual during periods of severe exacerbation of a duodenal or prepyloric ulcer When it is marked the patient is said to have functional pyloric stenosis , meaning that the obstruction is due to spasm and oedema in the area

In most cases of gastric retention caused by an active ulcer the inflammation responds to conservative measures but in some when a lot of scarring is present *as well pyloric function cannot be restored* and an *operation becomes obligatory* Wilkinson (1942) recommended that patients with acute gastric retention should have day and night hourly feeds of 3 oz of non curdling mixture such as reconstituted evaporated milk plus 2 dr of colloidal aluminium hydroxide followed after 30 minutes by continuous syphon drainage for the second half of each hour Supplementary intravenous glucose saline solution should be given in most cases On this regime those patients from whom more than 20 oz of fluid were still being drained per 24 hours after 3 days were ultimately all found to require surgery Wilkinson therefore recommended this as the criterion for operation Obstruction which has been present for more than 3 months or which produces marked radiological evidence of retention is also found always to necessitate surgery Gastrectomy is the operation of choice and it is advisable to add a vagotomy if gastroenterostomy is used

Obstruction near the pylorus developing late in life in patients who have not suffered from dyspepsia for a number of years may be due to scarring or so called *organic stenosis ' and this nearly always calls for surgical relief* A gastroenterostomy may be used if the patient is old and frail (and cancer can be excluded) though Maingot (1957) advised that vagotomy should also be added in these cases

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CHAPTER 4

ULCERATIVE COLITIS AND ILEITIS

BRYAN N BROOKE

SURGERY as the elective treatment of ulcerative colitis has come to the fore only since the introduction of the adherent ileostomy bag in 1944, and its increasing scope is largely owing to the revolution which this appliance has wrought Before this an ileostomy was guarded by a box or similar contrivance which provided no watertight seal with the skin The contents of the small intestine being fluid and the movements of the ileum less predictable than those of the colon, an ileostomy in that era came to be considered a leaky incapacitating disaster, only to be established as a life saving measure and this view still prejudices the proper treatment of patients with ulcerative colitis in some quarters today Excoriation of the skin from constant contact with ileal excreta added misery to disability, and bowel excision as an elective procedure could not be contemplated The bag introduced by Koenig and Strauss had a broad face or flange which could be glued to the skin around the stoma with waterproof cement and could be drained from a plug at its lower end The lot of the patient with an ileostomy was thus changed overnight for he was no longer barred from normal social activities through fear of intestinal incontinence Surgery could now advance from a defensive position limited to saving life and by colon excision could make possible a return to full and gainful activity

Success depends upon an efficient stoma, which must project sufficiently from the skin to permit evacuation directly into the bag since a flush stoma leads to excoriation of the skin and unseating of the bag at the same time it must neither prolapse recede, become stenosed nor develop a fistula Gradually a technique has evolved which has mastered these difficulties and which fashions a stoma to which the adherent bag is readily adapted As a result the demand for surgical treatment has increased

Ten years ago surgical cure necessitated three stages ileostomy colectomy, and excision of the rectum However familiarity with the technique of colon excision has led to the elimination of multiple stages with their repetition of operative hazards and now one stage pan proctocolectomy is preferred unless the patient is too ill to withstand a dissection within the pelvis In such a case colectomy is performed first followed by rectal excision later when the patient is stronger With the greater safety achieved indications for operation have widened and the original indication—to save the threatened life—has at the same time been reinforced for such is the accumulation of technical experience in the surgical management of this disease that it is now possible to undertake colectomy with success in cases of perforation or impending perforation and of massive bleeding in which operation would previously have been regarded as too hazardous

INDICATIONS FOR OPERATION

Surgery is indicated when it has become unlikely that a patient will return to normal life as a result of other treatment when complications develop or when

there is a threat of malignant change In pathological terms the first main indication arises when mucosal ulceration has reached an irreversible stage This is not always easy to detect but certain radiological signs are significant it is sometimes possible to observe from barium studies that the mucosa is undermined for the barium runs into what appear to be small collar stud cavities In some acute cases all that remains of the mucosa is oedematous pseudopolyps sometimes situated at regular intervals and mimicking haustration Pseudopolyps do not in themselves provide a specific indication for operation for they are not as sometimes feared harbingers of malignant change However this appearance of pseudohaustration is associated with ulceration deep into the muscle of the bowel wall and indicates irreparable damage

Uncomplicated cases

In the majority of uncomplicated chronic cases the state of the mucosa can only be guessed at from clinical evidence when for example even during periods of remission some diarrhoea persists with perhaps 2–3 ill formed motions per day then probably the mucosa is irretrievably damaged Apart from the hazard of carcinoma (*see* page 33) the main criterion for operation must always be the degree of disability Is the patient able to follow normal pursuits without undue limitation? If not is there likely to be any return to normal health without surgery?

Complicated cases

The clinical picture however is seldom straightforward not infrequently complications bring a patient to surgery the commonest site for them being the anal region where fistulae are apt to develop particularly rectovaginal ones in women incontinence promotes fissures and frank ulceration of the anal canal and the usual surgical methods of cure cannot be applied for after excision of an anal lesion in the presence of infection of the bowel above healing is impossible

Remote complications

Complications remote from the intestine though less common than the anorectal group provide a strong reason for urgent removal of the colon for their persistence may lead to permanent disability Arthritis affecting principally the large joints and iritis less common than arthritis both subside after removal of the bowel though neither is permanently relieved by any other form of treatment Both may cause irreparable damage if bowel excision is too long delayed at best a stiff joint at worst blindness Skin lesions such as erythema nodosum and exfoliative dermatitis are a not uncommon but less disastrous remote complication though the rare pyodermia gangrenosum can cause serious skin loss

Impending perforation

Operation is urgent when perforation is about to occur and the impending condition is easier to recognize than the incident itself which can be clinically silent As the wall of the large intestine is weakened by the extension of ulceration into its muscular layer it begins to distend this is particularly noticeable in the transverse colon where the contents tend to collect in its dependent part stretching the flabby bowel by their weight Colonic ileus is manifest clinically by small bowel colic with lower central distension the syndrome has sometimes been mistaken for mechanical obstruction caused by a stricture but in point of fact the

fluid intestinal contents associated with this disease can pass through almost any stricture The author has only once seen a stricture cause obstruction and that was in a bowel already defunctioned by an ileostomy with the colon in continuity strictures do not completely close even when carcinomatous The colon cannot recover once the state of distension and colic has been reached, a state which may be observed early in the disease, particularly under the influence of corti costeroid therapy (Brooke, 1956)

There can be no uncertainty at this stage about the need for operation and delay is inexcusable, not only because perforation may now take place at any time but also because the technical difficulties of colectomy, already considerable increase as the syndrome develops The colon wall begins to disintegrate its place being taken by parietal peritoneum or adjacent viscera The development of distension and colic must therefore be regarded as an absolute and urgent indication for excision of the colon

In these circumstances there is a strong urge to do no more than ileostomy, but the temptation must be resisted for little general improvement of these very ill patients results and perforation may occur in spite of deflexion of the faecal stream Despite the grave general condition colectomy can, and should be undertaken it should be done by a surgeon with experience in this condition for though colectomy for uncomplicated ulcerative colitis is not difficult the need to avoid bowel rupture with gross peritoneal soiling during manipula tion to remove the disintegrating colon renders the operation extremely trying and difficult

Perforation

When free perforation has occurred primary colectomy is the operation of choice ileostomy alone being almost invariably fatal The first 8 patients subjected to colectomy for free perforation by Ripstein (1953) all survived The diagnosis of perforation is confirmed by radiography on finding gas beneath the diaphragm Operation should be undertaken immediately unless the condition is late and there is clear indication that localization is taking place The author has seen 4 patients who survived free perforation without operation but localization is unusual and in its absence emergency colectomy should be performed however sick the patient and long standing the perforation

Haemorrhage

Perforation is fortunately not common occurring in less than 5 per cent of hospital cases Haemorrhage of a severity sufficient to call for emergency colec-tomy is even rarer But whereas perforation is usually a complication of recent disease and seldom occurs when it has reached the chronic indolent stage massive bleeding can occur at any stage it may sometimes be associated with perforation The patient becomes exsanguinated surprisingly rapidly though there is seldom a single major bleeding point, but only a general ooze It would be logical to remove the whole large bowel but the patient s general condition will seldom permit more than colectomy, and dissection in the pelvis has to be avoided Further massive bleeding from the rectum has been encountered following colectomy but has been controlled by instilling 5 ml of Russell s viper venom with 40 ml of 1 in 1 000 adrenaline in 500 ml of saline solution slowly into the rectum through a catheter in the exteriorized upper rectosigmoid stump

Liver damage

A further consequence of progressive penetration of the bowel wall is portal bacteraemia (Brooke and Slaney 1958) and there is evidence that this is as oci ated with the liver damage which can occur in this disease Jaundice is of bad prognostic import and colectomy in the presence of jaundice is often fatal though patients usually survive jaundice which develops post operatively on the other hand evidence of a lesser degree of liver damage is an indication for bowel excision Persistent pyrexia fluctuating around 102–104°F is characteristically associated with portal bacteraemia and so suggests the possibility of liver damage and the condition may be assumed to be imminent when collar stud cavities are demonstrable radiologically—both therefore are indications for colectomy

Carcinomatous change

Carcinomatous change is a clear indication for surgery though all too frequently it is attacked when beyond cure The usual symptoms of malignancy being similar to those of ulcerative colitis they are masked, and often the lesion is far advanced when first recognized a noticeable increase in blood in the stool or the onset of pain should suggest malignant degeneration Carcinoma frequently lurks un suspected at the site of a stricture and the discovery of a stricture in the colon by radiography or in the rectum by sigmoidoscopy is therefore a sound reason for advising operation The risk of malignancy increases in proportion to the duration of the dis ase and surgery should therefore be con idered if there is a long history, even without clinical evidence to suggest malignant change nor must it be thought that carcinoma is unlikely to arise because the diarrhoea is mild Too many patients have now been seen who developed carcinoma following advice against surgery on the grounds that the disease appeared to have burnt itself out only 2–3 motions slightly stained with blood being passed in the day

Cases requiring special caution

It is important to know whether a patient has been treated with corticosteroids for it has been observed that those who have are prone to post operative collapse owing to adrenal failure (Slaney and Brooke 1957) Indeed this may happen even after an interval as long as 2 years after cessation of cortisone (Salassa and his colleagues 1953) The collapse occurs quite suddenly, within 12–24 hours of operation unfortunately there is no method whereby adrenal reserve may be assessed and either corticoid cover must be given over the operative period to all patients who have ever received cortisone or its analogues or else the condition must be carefully watched for and treated as it arises Both methods carry risks and the choice between them must be a personal one If prophylactic cover is used a broad spectrum antibiotic should be given as well

CHOICE OF OPERATION

The only certain way of eliminating ulcerative colitis is by removing all the large bowel Resection of the colon only with ileorectal anastomosis undoubtedly achieves improvement for a time but experience has shown that excision of the rectum and the institution of an ileostomy ultimately become necessary in all too many cases either on account of recrudescence in the rectum extending into the ileum or of carcinoma or of remote complications (Cattell 1953 Gabriel 1953

Brooke 1956) There are, however, a few applications for the more limited operation, in those in whom the rectum is normal or near normal—less than 5 per cent—this should be the first approach for excision of the rectum can be undertaken later should ulceration subsequently develop there With children time may thus be gained until they reach an age when ileostomy can be more easily managed Mental deterioration sometimes seen in this disease is a difficult problem for patients thus afflicted are as incapacitated with an ileostomy as they were with diarrhoea, for them if operation is imperative the risks of ileorectal anastomosis must be accepted

Excision of the colon with permanent ileostomy is contraindicated in enterocolitis (*see* page 37) for the ileitis may persist and prove fatal (Cooke and Brooke 1955) However, the ileitis has sometimes responded to steroids so limiting the disease to the large bowel which may then be resected It is too soon to be sure that the small bowel lesion will remain permanently quiescent In contrast, ileitis secondary to the usual form of ulcerative colitis and the result of incompetence of the ileorectal valve subsides after excision of the large bowel even when affected ileum has been used for the ileostomy (Brooke, 1956 Counsell 1956)

SPECIAL POINTS OF TECHNIQUE

The operation of coloproctectomy is usually straightforward, but when the bowel wall has become friable and adherent as it is prone to do after cortisone treatment difficulties may become almost insuperable and the mobilization is fraught with danger Adhesion is most common to the parietal peritoneum across the paracolic gutter in the lower descending and sigmoid regions less often in the caecum and ascending colon Attempts to detach the colon by defining a plane of cleavage between colon and peritoneum inevitably leads to perforation with disastrous soiling The best course particularly when the bowel is dilated is first to aspirate its contents but repair of the necessary hole can be difficult It is best to make the opening close to the angle of reflexion of the peritoneum An incision through parietal peritoneum to mobilize the bowel is then placed at a little distance from its attachment to the bowel thus leaving a small leaf of peritoneum which may be sutured down over the hole made for suction as a covering sutures placed from peritoneum through to bowel and back in mattress fashion usually hold firm Wherever the parietal peritoneum is adherent it must be removed with the bowel like a postage stamp

Ileostomies used to be made by allowing a length of bare ileum to protrude from the abdominal wall The exposed serosa then became covered with granulations and fibrosis subsequently drew the mucosa down to the skin in about 2–3 weeks leading to a stricture in 1 case in 4 To avoid this skin grafting was tried but was never satisfactory as it often resulted in fistulae and failed to eliminate strictures Serositis also ensued if the ileum was uncovered Crile and Turnbull (1954) have shown that this causes ileostomy dysfunction a condition described by Warren and McKittrick (1951) and seen in 130 of their series of 210 ileostomies with a fatal outcome in 7 The malfunction of the stoma is associated with colic and much loss of fluid and electrolytes during the early weeks after operation The device of mucosal eversion (Brooke 1952 1954) was introduced to eliminate stricturing but it has also abolished serositis

About 3 inches of ileum is withdrawn from the abdomen and the whole thickness of ileal wall is seized with a Duval lung forceps passed halfway down its lumen The distal half is then turned back over the proximal half like a cuff The emerging

bowel is kept from dropping back into the abdomen by a stitch through its mesentery to skin This stitch also takes a bite of the everted cut edge and the rest of the bowel edge is sutured direct to skin with interrupted stitches No sutures may penetrate serosa for this causes fistulae Crile and Turnbull (1954) use a similar method but also remove serosa and muscle from the portion of bowel to be everted

All possible sites of internal herniation should be closed for example the lateral gutter to the left of the exteriorized distal end of the colon in primary colectomy also the para ileal gutter and this may be done by a purse string suture for a double ended ileostomy and more simply for the terminal form by sewing the cut edge of mesentery to the parietal peritoneum The resultant fixation of the mesentery is of importance in preventing recession and prolapse which can also occur owing to herniation when the opening in the abdominal wall is too wide (it is sufficient if the tips of two fingers can be inserted) or the wall itself has become attenuated by infection If subsequently the ileum prolapses it should in no circumstances be resected a formal laparotomy is required either to re attach the mesentery or to move the stoma to a new site depending on the cause

MORTALITY OF THE DISEASE

At the end of the last century the prognosis in ulcerative colitis was extremely grave indeed recovery was considered to be impossible (White 1895) It is still probably true that recovery is impossible but fatalities are less common At the turn of the century 55 per cent mortality was quoted by Allchin (1908) Just over 25 years ago 30-40 per cent of those admitted to hospital died (Hern 1931 Hardy and Bulmer 1933) and the most recent figures show that 22 per cent die in the first year rising to approximately 33 per cent after 5 years (Rice Oxley and Truelove 1950) All these figures are for patients in hospital and therefore make fair comparison with surgical statistics No long follow up has yet been under taken since the advent of corticosteroid therapy neither has any attempt been made to follow all non surgical cases to death to discover whether or not all ultimately die from the disease or its complications Sloan Bargen and Gage (1950) estimated that of 2 000 patients of an average age of 34 years 50 per cent of those expected to survive 20 years had done so

Operative mortality

At the Lahey Clinic the mortality among patients admitted to hospital with ulcerative colitis fell from 22 per cent in the period 1928–46 to 5 per cent in the years 1947–52 the operative mortalities being 13 7 and 2 per cent At St Mark s Hospital London the operative mortality has fallen from 8 to 2 7 per cent (Dukes and Lockhart Mummery 1957) In the author s series ileostomy and excision has carried a 5 per cent mortality 8 per cent of all the patients having died Late deaths from such causes as obstruction carcinoma and lung abscesses have raised the figure to 11 per cent

POST OPERATIVE LIFE

In order to assess the capacity of those living with ileostomies 101 patients were interrogated by questionnaires at the end of December 1955 (Brooke 1956) 7 were convalescent of the remaining 94 92 were at full work and 2 were doing no work because of blindness following iritis 1 of these also having arthritis Five patients did not regard the ileostomy as satisfactory though they were not

prevented from following full employment, 11 patients who found it satisfactory suffered slight or intermittent excoriation Most patients were able to follow pastimes such as swimming dancing and tennis Limitation in activity experienced by 34 patients was due to discomfort on stretching, bending or lifting Approximately 50 per cent of the patients restricted their diets most because fruit skins or pips formed an indigestible bolus causing colic as it reached the unyielding ileostomy stoma some found that fruit juices green vegetables or salads made the motion fluid others avoided a large meal in the evening for this so filled the adherent bag during the night as to require its evacuation, 6 patients were dieting in order to reduce an embarrassing increase in weight (for example, 4 st 7 lb to 12 st 8 lb 8 st to 15 st) Results had remained satisfactory in those patients treated 5 years or more previously, 5 of them having had ileostomies for 10 years or longer

The fear has been expressed that removal of the rectum might lead to impotence in the male, specific inquiry on this point has shown the fear to be ungrounded though it has not been possible to put the question to every male patient Four women have borne babies without complication to the ileostomy, and have subsequently breast fed them Two had normal pregnancies twice, but 1 patient had to be operated on for obstruction during the neonatal period

COMPLICATIONS AND MORBIDITY

The commonest complication, both early and late following ileostomy is intestinal obstruction An important feature of normal small intestine is its writhing movement which enables kinks to be unfolded and so prevents wind or faeces becoming trapped at a bend Ileostomy fixes the small bowel at one point and usually some adjacent loops by adhesions as well As a result about 1 patient in 5 suffers bouts of colic at some period from the fourth to tenth day as intestinal activity returns but in most cases the obstruction corrects itself Laparotomy has been necessary either in early convalescence or following a subsequent operation, or later requiring re admission in 15 cases out of 216 in the author's series, though the incidence is tending to fall Obstruction has also been the cause of 1 post operative death and 2 later deaths Swinton (1956) reported that at the Lahey Clinic 134 patients (43 6 per cent of the series) developed some degree of obstruction 72 patients required surgical intervention 14 soon after operation and 58 later on In the series by Wheelock and Warren (1955) of 230 patients 26 developed late obstruction

Other complications of importance are all related to the ileostomy and they mostly arise within 1 year Excoriation of the skin has been common in the first 6 weeks after the establishment of an ileostomy but is seen less than it used to be Excoriation always heals if it is not maintained by continued soiling from a fistula or a stoma too near skin level Only revision of the ileostomy will then cure the condition Rubber sensitivity develops rarely—thrice in the author s series it usually presents late even up to 3 years after the institution of the stoma When excoriation starts at a late date with no reason such as fistula to account for it tests should be undertaken for sensitivity to both the bag and the cement

Stenosis is rarely seen since the introduction of the eversion technique of ileostomy Fistulae may develop if sutures are allowed to penetrate the serosa Another cause is chafing of the bag against the stoma when the thigh is flexed the stoma has then been placed too low and the condition calls for revision and re siting of the ileostomy Prolapse is becoming rare now that proper fixation of the mesentery

within the abdomen by closure of the para ileal gutter is undertaken in most centres it has occurred in 7 of the author s 174 patients alive 1 year after ileostomy Occasionally the mesentery becomes detached as the patient puts on weight even though non absorbable sutures are always used and prolapse may follow Since using the eversion technique recession has been more frequent it has been due to one of several causes—detachment of the mesentery retraction by adhesions or relapse between the layers of the abdominal wall or through too large a stab wound The cause can only be diagnosed and corrected by full revision through a laparotomy incision It has arisen in 9 patients of the 174 surviving 1 year At the Mayo Clinic only 14 per cent of 124 patients have been free of complications at the stoma during the year following operation and 43 per cent of those surviving 1 year required a revision this high incidence may be associated with the fact that skin grafting has been the practice there Lyons and Garlock (1954) reported that 20 per cent of 145 patients required re operation for complications 18 of the author s 174 patients surviving 1 year since the ileostomy have required operative revision 11 being performed at the time of excision of the rectum

OTHER CAUSES OF DIARRHOEA CALLING FOR SURGERY

Apart from specific causes of diarrhoea such as chronic dysentery, which must be excluded before a firm diagnosis of ulcerative colitis can be made there are three other main causes of chronic diarrhoea—carcinoma the steatorrhoeas and Crohn s disease Carcinoma needs no discussion here of the steatorrhoeas adult idiopathic disease is sometimes mistaken for ulcerative colitis even at sigmoid oscopy for proctitis is not infrequently associated with this disorder It may be suspected from the light colour and fluidity of the stool or from evidence of macrocytic anaemia and confirmed by a 3-day fat balance test

Enterocolitis (Cooke and Brooke 1955) is a rare condition showing radiological appearances of right sided colitis which some still regard as a form of ulcerative colitis The steatorrhoea which is present i a clue to the associated small bowel disorder Ileostomy is contraindicated (see page 34)

Regional ileitis

In Crohn s disease (regional ileitis regional ileocolitis) surgery has a larger part to play for though the frequency of recurrence after resection or anastomosis has caused a trend towards conservatism in the initial uncomplicated stages of the disease most patients ultimately require res ction for obstruction for persistent debilitating diarrhoea for fistulae or for anal and perirectal complications

Medical treatment has been entirely supportive namely rest high protein diet replacement of lost potassium administration of vitamin B_{12} and recently steroids But as Crohn himself has observed (1957) there is no satisfactory conservative treatment of 700 cases only about 10 recovered spontaneously Since operation becomes inevitable in most cases at some stage the fatality rate for the disease not treated by surgery is unknown The choice is between resection of the cica trized area and short-circuit Some favour one and some the other but there is little difference in the subsequent recurrence rates The average operative mortality is 5 per cent

Rarely the disease affects the whole large bowel as well when excision and ileostomy is unavoidable Ileitis then tends to recur at or above the ileostomy

Follow up of 270 patients operated on at the Mayo Clinic (van Patter and his colleagues 1954) showed an increasing rate of recurrence with the passing of

time from 37 per cent at 2 years, to 50 per cent at 5 years and 80 per cent at 15 years In the series of Cooke (1955) 83 out of 90 patients needed surgery Of the original 90 patients, 14 died 6 post operatively Of the 76 survivors only 9 were incapacitated 3 of them being convalescent after operation The rest were able to earn a living or run a home, despite intermittent attacks of colic or diarrhoea in some

Though the relapse rate is high the prognosis in terms of survival in those who recover from operation is better than used to be thought Indeed most of them live out a normal life span (Crohn 1958)

SUMMARY OF INDICATIONS FOR SURGERY IN ULCERATIVE COLITIS

Circumstances of emergency

(1) Perforation or impending perforation
(2) Acute haemorrhage
(3) Toxic case deteriorating and likely to die

Subacute and chronic cases

(1) Assessed on disability—patient unlikely to return to normal life by any other form of treatment
(2) Assessed on complications anorectal—fissures fistulae etcetera arthritis skin conditions including stomatitis iritis corneal ulceration
(3) Long standing disease threat of carcinoma particularly after 10 years or more of uncontrolled or incompletely controlled disease or particularly with evidence of stricture

Radiological

Evidence of undermining of mucosa dilatation usually observed in transverse colon pseudo polyposis of the haustral type stricture—usually found to be carcinomatous appearances usually associated with carcinoma

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CHAPTER 5

THE MANAGEMENT OF ILEOSTOMIES AND COLOSTOMIES

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THE MANAGEMENT OF ILEOSTOMIES

ONE fundamental difference distinguishes an ileostomy from a left iliac colostomy in health solid faeces escape from the latter, while only fluid or semi solid motions flow from an ileal stoma Furthermore evacuation from an established colostomy is usually under the control of a gastrocolic reflex and occurs only once or twice in a day, whereas it is rare to find an ileostomy entirely subject to a similar reflex and when it is so evacuation takes place after every meal More commonly ileal movements continue throughout the day and night at indefinite intervals and the control and collection of excreta is of paramount importance to the patient The man with a colostomy may take a fully active part in society with nothing more than a light dressing provided he can maintain a solid stool and regulate his life so that his bowel actions occur at expected times but the patient with an ileostomy has no such control and for him an apparatus for the collection of faeces is necessary, moreover its adaption to the ileostomy must remain watertight On the other hand the contents of the colon can be detected by their odour but ileal contents do not have this disadvantage except when some element of obstruction arises as a complication

Before operation

The management of a patient who is to undergo ileostomy starts before operation It may seem unnecessary to stress the point that any patient who is to have an artificial anus should be warned of it but it is surprising how often this is over looked Even those patients for whom an artificial anus is expected to be only temporary will be shocked by its revelation on the abdominal wall post operatively unless they have received prior warning

It is indefensible on ethical grounds not to allow a patient the opportunity of refusal to undergo such an operation However if acceptance is not obtained the consequences to the patient must be fully and clearly explained if the patient then persists in his attitude it is probably wise in these days of increasing medico legal actions to obtain a signed refusal in writing Apart from ethical considerations a preliminary explanation is of value for the patient s co operation is necessary for successful after care This is particularly important for ileostomy since its management by the patient is difficult and calls for application it will be an irksome task imperfectly performed if ileostomy life is not accepted in a positive manner

There are two ways of approaching the subject The patient may be told directly that the surgical cure of his disease will entail the institution of an ileostomy in all probability permanent but many patients with ulcerative colitis are young and highly sensitive and are often women to whom such an idea is abhorrent

To them it is possible to mention casually at first, that there is an operation for their disease They may then ask if they can have this operation for they are ill and incapacitated and well aware that unless something is done they are doomed to inactivity and possibly worse Alternatively a former patient can be used as a decoy being introduced to the ward as though on a friendly visit to the sister though in reality being there to reveal that he is restored to health and normal life The choice of approach must be decided on the type of patient but whichever method is used it is valuable to arrange an interview before operation between the patient and someone who has a successful ileostomy in order that doubts and difficulties foreseen may be discussed and dispelled This function is now undertaken by members of the Ileostomy Association branches of which are to be found throughout England and in Scotland and Northern Ireland

After operation

A transparent polythene disposable bag encloses the ileostomy when the patient returns to the ward and enables the stoma to be watched for activity without disturbance a small supporting ring of wool around the stoma acts as a splint and so prevents the wall of the bag pressing the stoma into the abdomen during the 48 hours before its fixation by natural means becomes more certain The stoma then becomes oedematous and not until this oedema has subsided is the permanent bag applied for its orifice should fit the stomal base with accuracy though not so closely as to cause chafing

The ileostomy begins to act usually within 24–48 hours certain electrolyte problems then arise and are best anticipated before deficiency causes general deterioration Salt depletion crisis in particular may present with sudden and profound collapse associated with peripheral circulatory failure Whereas the more urgent pre operative consid ration is potassium loss the problem switches to sodium post operatively because in the initial period of activity the volume of excretion is from 1 000 to 3 000 ml daily with a loss of some 150 mEq of sodium per litre Later the output drops sodium balance can then be maintained without the aid of intravenous therapy though additional salt with the diet is advisable particularly during periods of increased ileostomy activity when extra potassium may be needed as well

After 4–5 days when a more normal diet is being taken by mouth the ileostomy contents begin to thicken a process which may be encouraged by the administration of psyllium seed (I so g l) and within a short while it is possible for the patient to learn to apply the bag himself It is important to him to know that the special cement should be spread on to both skin and flange not too liberally and be allowed to become tacky before the bag is pressed on—just like mending a puncture In the first month the lateral side is reinforced with adhesive for leakage occurs at this site on recumbency more particularly before the patient gains weight and the concavity medial to the anterior superior iliac spine fills in

It is during this period that intestinal obstruction is most likely to occur It may be due to snaring of a loop of bowel in a gutter or round an adhesion or to fixation and kinking of several loops by fine adhesions as is seen after tuberculous peritonitis If obstruction is complete with cessation of wind as well as faeces laparotomy must be undertaken but the majority of these obstructions are incomplete and the episodes pass off after 36–48 anxious hours Relief can sometimes be obtained by introducing about 50 ml of saline solution through a catheter in the ileostomy In any case it is wise to inspect the stoma since this swells with

oedema during the first week and may be the site of obstruction owing to strangulation within the opening of the bag

By the time the patient is ready to leave hospital he must be fully conversant with the technique of bag management all the author s patients see an instructional film before departure Two bags are provided one to be washed and dried while the other is worn Benzene is used as a solvent for the cement and for removing the bag and cleaning the skin and flange The bag may be worn for as long as 3 days at a time or more for it can be emptied while worn but many patients prefer to change it daily for hygienic reasons A plastic harness or light elastic or fabric belt lying like a cuff between the flange and the body of the bag gives extra support by maintaining pressure on the flange

Ileostomy appliances

There are many types of ileostomy bag on the market (Lyons 1955) In choosing the appropriate appliance simplicity is the first requisite, it is preferable that the flange should be pliable, in all too many models the flange is reinforced or constructed of rigid material and convexly shaped so that it may be pressed deeply into the skin around the stoma This is undesirable since slight displacement may damage the ileum, cause a fistula and necessitate operative revision it is unnecessary, if the stoma is of adequate length and a pliable flange more readily adapts itself to the contours to which it must be attached The author s preference is for the simple bag made in one piece with a pliable flange (Salt and Son) since this type is slender and hardly perceptible under the thinnest clothing It can be detached from the skin for cleansing daily though it will remain adherent for periods up to a week or more, the longer it is kept in position the less likely is the skin to break down The chief alternative is the bag constructed in two pieces (Down Bros) with a flange separate from the body of the bag which is then detachable for cleaning The increased thickness required at the flange is the only drawback since it makes the bag more bulky also if the stoma is short clearance of the inner rim is not obtained and faecal soiling of the skin at the base of the stoma eventuates, leaving a small area constantly excoriated

Later management

The patient seldom needs encouragement to take a full normal diet after leaving hospital but a warning should be given to avoid eating the skins of certain fruits and vegetables such as plums and tomatoes since these can cause an obstructive bolus at the stoma Moreover some patients need to avoid fruit in the evening since they find that this promotes a more fluid and therefore more voluminous exudate which at night may cause embarrassment by leakage on recumbency (Brooke 1956) Extra salt should be taken whenever the small bowel discharges become more fluid Full activity can be undertaken for it is possible to play cricket golf tennis football and even swim and dive without disturbing the bag which being slender remains imperceptible even under a bathing dress

Patients vary considerably in the time they retain the bag in position but provided there is no odour the patient should be encouraged to keep the bag on for as long as possible in order to minimize skin damage If excoriation occurs the area around the ileostomy may be covered with lint rather than gauze which is more abrasive, and waterproof adhesive to which platform the bag is then cemented Zinc oxide cream Baltimore paste or barrier cream may be used

under the lint Karaya gum, a resin which is dispensed as a white powder has remarkable qualities for when dusted on to excoriated skin it encourages healing without interfering with the adhesive properties of the ileostomy cement Once excoriation has healed it seldom recurs provided the stoma remains efficient except for a small area of ⅛ inch in depth where skin meets mucosa and this can be protected by a ring cut out of lint and sealed down to the skin by the adherent flange

If any complication to the stoma arises which makes the management of the ileostomy impossible the patient must return to hospital Prolapse retraction and fistula can only be treated by a revision of the ileostomy performed through a laparotomy incision reconstructive operations confined to the stoma are ineffective and frequently lead to further trouble

All ileostomy patients should be given the opportunity to become members of the organization run for their welfare by former patients—the Ileostomy Association Its members not only organize a hospital visiting service but also continue to maintain contact in the post operative period in order to advise on ileostomy management and assist if difficulties arise Advice concerning the many different types of appliance is given also on such matters as jobs and life assurance Regular meetings are arranged when problems are discussed and appliances shown by their makers together with skin preparations A newsletter keeps members up to date who cannot or do not wish to attend meetings Contact with the national organization can be made at 4 Dering Street London W 1 Each patient is referred to the division covering the area in which he or she lives

THE MANAGEMENT OF COLOSTOMIES

Colostomies used to be constructed by exteriorizing an inch or two of colon leaving its serosal surface exposed In due course this became covered with a mass of granulation tissue which was gradually converted into a hard fibrous ring around the stoma Most surgeons have now abandoned this method and instead carefully unite the bowel mucosa to the skin edge to edge (Patey 1951) The result is a neat flat opening with no tendency to develop the stenosis which used to be such a common late complication of colostomy Prolapse is avoided by careful suture of the bowel mesentery to the parietal peritoneum

Management

It used to be considered necessary for colostomy patients to wash out the colon daily and this view is still held by some (Aylett 1954 Benjamin 1954) However it is burdensome for the patient who must cope with douche cans catheters and the like each morning and it is not without hazard since repeated enemas can lead to fatal perforation of the afferent loop (Hoffman and Macht 1954) a complication which has been seen as late as 20 years after operation For all patients therefore the aim should be to obtain a natural motion at a regular time each day and it is usual to find that one is passed about half an hour after rising in the morning and often another in the evening after a meal The bowels may be made to move in the morning if this does not happen naturally by drinking a cup of tea on waking or smoking a cigarette Regularity is assured by taking meals at regular intervals and at the same time from day to day The content of the diet also plays a part and in this respect the patient must experiment for himself it should be explained to him that there is considerable individual idiosyncrasy in such matters but that many patients find fruit and certain vegetables

such as spinach and onions are loosening while beer may have the same effect Once a patient has discovered the diet that suits him best he will find that his bowels act at times he can anticipate and that only the slightest soiling of his dressings occurs in the intervals The confidence that this gives is considerable and it is to this end that attention should be paid during the latter part of the patient s period in hospital

Clayton Jones (1956) has recommended the routine use of methyl cellulose for the control of colostomy action and for the elimination of faecal odour, he advised the following routine On waking 2 large mugs of tea followed after half an hour by 2 teaspoonfuls of methyl cellulose stirred briskly in an ounce of water Fluid intake during the day is kept small Another dose of methyl cellulose is taken in the evening if the colostomy action has been loose during the day

Colostomy diarrhoea is the greatest incapacity dietary indiscretions may be *a cause and can usually be identified without difficulty Though it is seldom* necessary to do so a solid motion can also be encouraged with chalk and opium aspirin bismuth, kaolin charcoal psyllium seed (I so gel) or methyl cellulose (Celevac), amphetamine sulphate taken after meals so as not to inhibit the appetite, has been suggested (Benjamin 1954) If diarrhoea is persistent a cause should be sought since it is usually due to an unsuspected condition and can be treated accordingly A fat balance test may reveal steatorrhoea calling for a reduction in fat or gluten intake a barium progress meal may bring to light an unsuspected Crohn s lesion requiring resection Previous surgery may play a part a partial gastrectomy can induce a recurrent or persistent diarrhoea very resistant to treatment

The modern colostomy appliance is not designed to be a receptacle for faeces but a means whereby a dressing may be retained over the opening and support be given to the abdominal wall at this site This purpose can be achieved with a many tail bandage and a piece of cardboard incorporated as stiffening in the dressings but it is convenient to supply a shallow plastic cup as a shield to be held in place by a light narrow belt or a corset of fabric or elastic Better are the belts made from Terylene or similar material (Colostomy Cummerbund, Salt and Son) since these are not only light and more comfortable in warm weather, but much easier to clean should accidental soiling occur The thick rubber bag with a wide mouth, which was at one time provided was probably necessary for patients who followed the lavage routine in order to collect fluid some of which was inevitably retained at the time of the enema It had the disadvantage of weakening the abdominal wall around the stoma thus leading to hernia and prolapse All rubber appliances also suffer from the failing that the odour of large bowel contents becomes more offensive on contact with rubber this is only occasionally encountered with ileostomy discharge which is comparatively odourless Attempts to use a plastic adherent bag have not met with marked success for the stiff heavy stool from a colostomy tends to cause it to become detached Indeed such bags are provided on the wrong premise since the whole management of a colostomy aims at producing bowel actions only at certain anticipated times when the patient may evacuate into a kidney dish or lavatory pan

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CHAPTER 6

HAEMORRHOIDS AND RECTAL PROLAPSE

H R THOMPSON

HAEMORRHOIDS

The term haemorrhoids includes anal haematomas which are commonly referred to as external haemorrhoids , and internal haemorrhoids which *consist of varicosities of the internal haemorrhoidal venous plexus and are covered* by mucous membrane

External haemorrhoid

An external haemorrhoid (anal haematoma) is caused by rupture of, or thrombosis in an external haemorrhoidal vein the resulting clot producing a tense painful swelling under the skin at the margin of the anal canal It varies in size from a small nodule 0 5 cm in diameter to a large swelling up to 4 cm across When small the characteristic dark blue tender swelling at the anal margin presents no difficulties in diagnosis but the differentiation between a large anal haematoma and a prolapsed thrombosed internal haemorrhoid is less obvious The latter may be distinguished however by the characteristic interhaemorrhoidal groove between the dark purple congested mucosa and the oedematous anal canal and peri anal skin This groove is formed by the attachment of the anal canal skin to the submucosal tissues between the internal and external haemorrhoidal plexuses

Clotting may occur in veins connecting the external and internal haemorrhoidal plexuses The patient complains of anal pain but on inspection no swelling is visible However palpation reveals a tender longitudinal ridge under the anal canal skin—the so called linear thrombosis

Management of an external haemorrhoid

The clot of an anal haematoma may be evacuated surgically or left to resolve the choice being determined by the duration and size of the lesion

If the patient is seen within 48 hours the pain of the haematoma is more severe than the pain which would be caused by a small surgical incision Immediate relief can be given by infiltrating the anal skin overlying the haematoma with a few minims of local anaesthetic and incising over the clot which is then gently expressed The small wound is kept clean by the daily use of soap and water, and a thin cotton wool swab is placed on the anus where it will remain without retentive bandages

After about 48 hours the pain of an anal haematoma of average size diminishes as the clot absorbs A surgical incision at this stage will be more painful than the resolving lesion and the application of lead lotion compresses is all that is required With larger haematomas involving one quarter or more of the circumference of the anal canal the pain is more intense and more persistent Resolution instead of being complete *in 7–10 days takes up to 3 weeks and a skin tag may*

result Evacuation of these large clots may be practised up to 1 week after onset and a small area of skin overlying the clot should be removed to assist drainage

Very occasionally a haematoma may be secondary to disease higher up in the rectum such as a carcinoma and this should be excluded by careful history taking and digital examination of the rectum before treatment of the haematoma The discomfort of such an examination can be diminished by introducing anaesthetic ointment or jelly on a wisp of cotton wool rolled on an orange stick and by using it also to lubricate the examining finger

The management of most anal haematomas should remain in the hands of the general practitioner for they do not require the attention of a consultant or treatment in hospital

Internal haemorrhoids

There are three primary and four secondary haemorrhoids This number and their position in the rectum is determined by the anatomy of the superior haemorrhoidal artery which divides into a right and left branch the right branch subdividing into anterior and posterior branches Around these develop the three primary haemorrhoids a right anterior a right posterior and a left lateral Secondary haemorrhoids may appear one on either side of the left lateral and right posterior primary ones Variations of this anatomical pattern do occasionally occur but the pattern is so constant that for practical purposes there is no need to enumerate them

It is unusual to find a patient with all three primary and four secondary haemorrhoids developed simultaneously Every variation from a single primary haemorrhoid to the full complement may be encountered This point must be remembered when assessing the results of treatment and deciding whether a previously treated haemorrhoid has recurred or whether a new haemorrhoid has since developed

Symptoms

Haemorrhoids bleed and protrude from the anal orifice Bleeding from a haemorrhoid has characteristic features It occurs in spurts at defaecation soiling the front of the lavatory pan As a haemorrhoid enlarges it protrudes through the anal orifice on defaecation retracting spontaneously afterwards owing to contraction of the levator ani and conjoint longitudinal muscles Later the haemorrhoids drop out on the slightest exertion and the longitudinal muscle becomes so stretched that manual replacement becomes necessary

Three degrees of haemorrhoids are described (1) when bleeding is the only symptom (2) where there is bleeding and prolapse only on defaecation with subsequent spontaneous reduction and (3) where the prolapse occurs on defaecation and on the slightest exertion Spontaneous return does not occur This simple classification is also a valuable guide in the choice of treatment

Secondary symptoms such as pruritus ani pain from small thromboses and moisture of the peri anal region are frequently present

The symptoms of haemorrhoids are intermittent and vary in intensity and some complications such as thrombosis may resolve even without treatment Certain manufacturers of patent medicines take advantage of this fact and market a number of useless materials some even for oral administration with the certainty that they will be held to have had good effect

Complications

THROMBOSIS —The dilated varicosities may become thrombosed and the thrombosis usually affects the external plexus as well resulting in a deep purple congested swelling protruding from the anus A single haemorrhoid or all three primary haemorrhoids may be affected

STRANGULATION —When haemorrhoids prolapse and become thrombosed sphincter spasm may be so severe that the venous return and subsequently the arterial supply are obstructed, resulting in strangulation and gangrene of the pile The pinkish mauve mucosa covering the internal haemorrhoid becomes black and sloughing occurs

INFECTION —Thrombosis and strangulation are invariably complicated by infection *This can lead to ischiorectal abscess, gangrene of the rectum or portal* pyaemia The last two however are surgical curiosities and antibiotics have abolished the fatal outcome of former days

HAEMORRHAGE —The haemorrhage from an internal haemorrhoid has already been described *Occasionally, however bleeding may be considerable and be* partly external and partly concealed On examination the bowel may be found to be full of blood As a sound working principle a large rectal haemorrhage should never be attributed to a haemorrhoid until the rest of the intestinal tract has been thoroughly investigated

ANAEMIA —Repeated loss of small amounts of blood over a period of years can give rise to severe secondary anaemia and it is not unusual for a patient attending for treatment of piles to be found to have a haemoglobin concentration below 50 per cent Prompt efficient treatment of the haemorrhoids results in rapid correction of the anaemia

Differential diagnosis

It cannot be emphasized too strongly that before any treatment is prescribed for a patient whether old or young suffering from persistent or recurrent rectal bleeding, the possibility of a carcinoma of the rectum or lower colon must be excluded Carcinoma of the rectum can occur even before the age of 20 years and the diagnosis is then frequently delayed the bleeding invariably being attributed to haemorrhoids It must be emphasized that a patient presenting with a minor rectal lesion may have *as well* a latent carcinoma of the rectum *Therefore*, it is not enough to establish the presence of haemorrhoids or other minor rectal conditions as the cause of rectal symptoms without first excluding the possibility of an associated carcinoma

The management of a patient presenting with a *first* attack of rectal bleeding should follow a set plan There are two possible approaches The first is to subject the patient to a complete investigation including a digital examination of the rectum, a bimanual examination of the pelvis proctoscopy sigmoidoscopy, barium enema radiography and blood count However this will prove to have been unnecessary for the majority of such patients as well as putting them to considerable discomfort and inconvenience The alternative is an intelligent assessment of the symptoms and clinical signs thus in a young patient a *first* episode of rectal haemorrhage without other symptoms may be diagnosed as due to haemorrhoids, *provided a thorough digital examination of the rectum* is negative All rectal neoplasms and some tumours of the lower colon can be diagnosed by such an examination of the rectum combined with abdominal

palpation Should the bleeding persist or recur in spite of treatment of the haemorrhoids then full investigation is imperative and should not be long delayed

The other common condition giving rise to rectal bleeding without other symptoms is non specific proctitis which in its early stages is commonly diagnosed as haemorrhoids Indeed the differential diagnosis between haemorrhoids and proctitis may be difficult even for the most experienced

Aetiology and prevention

Haemorrhoids are a very common complaint though they are rarely seen before the third decade That they seem occasionally to run in families suggests the possibility of a hereditary factor but bowel habit undoubtedly exerts an influence of paramount importance on their development and it is to the regulation of defaecation that medical and prophylactic treatment are directed

When food is taken the gastrocolic reflex stimulates the colon to move on its contents This leads to filling of the rectum giving rise to an urge to defaecate an urge which therefore tends to follow a meal If the urge is ignored or the act inhibited the rectum becomes loaded with faeces and the haemorrhoidal veins become congested Postponement of defaecation or hurried attempts to open the bowels at irregular times leads to less easy and less natural evacuation Prolonged straining and eversion of the anal canal then promote venous distension and the formation of haemorrhoids

In order to encourage normal effortless defaecation it is necessary to establish a regular post prandial habit at the same time or times each day The act must be unhurried and the stool soft but formed This should be achieved by a well balanced diet liberal fluid intake and regular exercise and not by the use of purgatives Indeed the purgative habit ultimately aggravates haemorrhoids as well as predisposing to many other minor anorectal disorders

Injection therapy

INDICATIONS AND RESULTS —Injection treatment is indicated for first and second degree haemorrhoids When a full course of treatment has been given the patient may remain free from symptoms for 3–5 years Should the symptoms be relieved after the first injection he may fail to appreciate the necessity of attending for a full course Such patients have an early relapse of symptoms and it is they who bring discredit on injection therapy For early third degree haemorrhoids injection treatment may also be remarkably successful but no good results are obtained in haemorrhoids which are constantly prolapsed The choice between injection therapy and surgery for borderline cases depends on many factors the age of the patient the presence of constitutional disease the inconvenience on the one hand of multiple visits for injections, or on the other of a 2 weeks stay in hospital followed by 3 weeks convalescence In young patients operation is best postponed for as long as possible In very old patients haemorrhoidectomy is best avoided When offered a choice most patients prefer to give injection therapy a trial If symptoms recur further injections may be given However it is useless to persist in injection therapy if there should be a recurrence after three courses of injections

RATIONALE —The object of injection treatment is to place a chemical substance under the mucous membrane of the haemorrhoid which produces fibrosis in the submucous areolar tissue This results in obliteration of the haemorrhoidal

varicosities and retraction of the haemorrhoid into the anal canal, with fixation of the mucosa to the underlying internal sphincter muscle If this object is achieved, bleeding will cease and prolapse will no longer occur It must be emphasized that *injection treatment is complementary to medical treatment*

METHOD OF INJECTION —The equipment required for injection treatment of haemorrhoids is simple and inexpensive and consists of finger cots or rubber glove, a water soluble lubricant swab holding forceps a syringe with two haemorrhoidal needles and an illuminated proctoscope

A safe and satisfactory solution for injection is 5 per cent phenol in almond oil with 2 gr of menthol to the ounce The injections are given with the patient in the left lateral or knee chest position The first injection is placed into the pedicle of the pile at or just above the anorectal ring The effect of this injection is to draw the pile up into the anal canal All three pedicles may be injected at the first consultation or treated singly at weekly intervals If the three pedicles are *injected simultaneously*, the resulting sclerosis is better but post *injection* discomfort may be more troublesome After the pile pedicles have been treated attention is directed towards the bases of the piles and when these areas have been sclerosed a final injection may be given into the submucosa of the inter haemorrhoidal areas Up to 10 ml of solution may be injected into each haemorrhoid at one time although it is customary to inject only 3–5 ml of solution into each

The prick of the needle as it passes through rectal mucosa is rarely felt If a patient complains of a needle prick this usually means that the injection is being given through the sensitive skin lining the anal canal and is therefore wrongly sited During the injection the patient experiences an uncomfortable feeling of distension If larger amounts of solution have been injected into all three haemorrhoids he may complain of feeling dizzy and it is unwise to allow him to leave the surgery until 15 minutes have elapsed After injection therapy some patients suffer no discomfort whatever others complain of a dull ache which comes on an hour or so after injection and persists until the following morning A hot bath in the evening and two compound codeine tablets bring much relief *Injections should only be given when the rectum is empty* The presence of injection solution under the rectal mucosa may give rise to a persistent desire to defaecate The patient should be warned of this and advised not to have his bowels open until the morning after the injection to avoid causing the injected piles to prolapse

COMPLICATIONS —There are three causes of complications a blunt needle an inexperienced operator, and an uncooperative patient Before use the needle should be tested by drawing its point across a gauze swab if it catches the point is bent and it should not be used The very minimum of pressure is required to penetrate the rectal mucosa with a sharp needle If a blunt needle is used considerable pressure has to be exerted and when the rectal mucosa is finally pierced the needle may pass through into the deeper layers of the rectum and may in the male penetrate the prostate or urethra If the needle passes into instead of under the mucous membrane of the rectum and the injection is started the mucous membrane turns white and subsequently ulcerates This produces the constitutional symptoms of malaise headache generalized body ache and pyrexia similar to an attack of influenza If a patient gives such a history after injection therapy it is almost certain that an injection ulcer has been produced

Although these ulcers are to be avoided subsequent healing by fibrosis gives an excellent final result

Very occasionally a patient may complain of pain under the costal margin and a taste of carbolic in the mouth possibly owing to small amounts of the solution having been injected directly into the lumen of a haemorrhoidal vein and carried via the portal vein to the liver If larger amounts reach the liver by accidental intravenous injection more serious symptoms such as rigor transient jaundice and an enlarged liver may result

The complications of injection therapy may be summarized as follows

(1) Haematuria oleo uria prostatic abscess or epididymo-orchitis as a result of injecting too deeply

(2) An injection ulcer owing to injecting too superficially

(3) Chemical hepatitis sometimes with severe local and constitutional symptoms this results from intravenous injection

(4) Haemorrhage at the needle puncture point tends to occur when injections are given into previously treated haemorrhoids From the nature of the bleeding it would seem to come from a small arteriole The pressure of dissecting or artery forceps over the site of the puncture and the use of an adrenaline pack usually suffice to stop the bleeding

Operative treatment of uncomplicated haemorrhoids

Operation is indicated when injection treatment has failed and for large prolapsing third degree haemorrhoids The most grateful patients after haemorrhoidectomy are those whose symptoms have been the most troublesome before operation The s l ction of a patient for haemorrhoidectomy therefore should depend not only on the local condition of the haemorrhoids but also on a careful assessment of the pain and inconvenience caused by them

The aim of haemorrhoidectomy is the excision of the external haemorrhoid and ligation of the internal haemorrhoid at its pedicle This is done with the removal of varying amounts of mucous membrane Post operative discomfort is inevitable following operation on such a sensitive area as the anal canal That opinions differ on the best way to remove haemorrhoids is reflected in the variety of operative techniques described Some consider that forcible stretching and rupturing of the sphincter muscles immediately before haemorrhoidectomy lessens post operative pain and spasm others infiltrate long acting anaesthetic solution into the peri anal space though this predisposes to abscess formation Some surgeons aim at first intention healing by primary suture others believe that the wounds should be allowed to granulate Whatever method is employed however gentleness in the handling of the tissues greatly reduces post operative discomfort

COMPLICATIONS —Haemorrhoidectomy may be complicated by retention of urine secondary haemorrhage skin tags abscess and fistula or stricture formation the last depending on the amount of anal canal lining that has been removed When the amount has been large the anal canal should be kept stretched by a dilator during the healing period

RESULTS —The relief of symptoms and freedom from the daily dread of painful defaecation gives the patient a new lease of life Recurrence after a well planned haemorrhoid ctomy i exceptional

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RESULTS —The relief of symptoms and freedom from the daily dread of painful defaecation gives the patient a new lease of life Recurrence after a well planned haemorrhoidectomy is exceptional

Treatment of prolapsed thrombosed haemorrhoids

There is considerable difference of opinion on the management of prolapsed thrombosed haemorrhoids Dissatisfaction with conservative methods of promoting resolution and absorption arises from the fact that complete resolution may take up to 3 weeks, moreover, the haemorrhoids are then still present and may subsequently require injection or removal It is argued by some that if at the beginning of an attack the haemorrhoids are removed, the convalescence is that of a standard haemorrhoidectomy, which is no longer than the time required to obtain relief by conservative methods On the other hand, operating on prolapsed thrombosed haemorrhoids carries the risk of spreading thrombosis and infection In the past, serious infective complications, delayed healing of wounds and even gangrene of the rectum has followed such operations However, infection can now be controlled with antibiotics before and after operation, and the risk of infective complications is accordingly diminished Some surgeons therefore now elect to operate on thrombosed haemorrhoids On the other hand, it is held by others that the risk of spreading localized infection is not justified on the grounds that it may be controlled with antibiotics

Failure of conservative methods is invariably due to delayed and inefficient treatment If the patient seeks relief early the haemorrhoids should be replaced and the patient confined to bed with the foot of the bed raised Lead lotion compresses should be applied to the anus 4 hourly the consistency of the stools should be kept soft with a suitable laxative and the patient given a sedative such as phenobarbitone 30 mg (0 5 gr) 3 times a day The colon and rectum should be empty before replacing the haemorrhoids If as is often the case, the rectum is loaded with faecal material, this can be simply and quickly evacuated by using a sodium biphosphate enema available in a disposable pack (Harker and Stagg)

The discomfort of replacing the haemorrhoids may be lessened by the liberal use of an anaesthetic jelly or, when a patient has delayed seeking treatment and when marked sphincter spasm is present the injection of local anaesthetic into the ischiorectal fossae or the intravenous injection of thiopentone After replacement of the piles the bowels should be kept confined for 48 hours and if the piles subsequently prolapse again at defaecation they should be replaced immediately With prompt efficient treatment a patient will recover from an acute attack of haemorrhoids within 1 week The commonest reason for failure is that the patient tries to carry on as usual instead of resting in bed for a few days

Haemorrhoids in women

Many women will volunteer that their haemorrhoid symptoms are always worse just before and during menstruation, and there is no doubt that this is owing to pelvic congestion and to the necessity of wearing a tampon or sanitary towel During pregnancy the gravid uterus especially if retroverted can cause considerable pressure on the rectum and the valveless haemorrhoidal veins, so exacerbating haemorrhoids After delivery the perineal tissues are soft and stretched and may be damaged with the result that haemorrhoids may prolapse marring the pleasure and happiness of the early days of the puerperium

Operative treatment during pregnancy is illogical as the pregnancy itself is an aggravating factor of the haemorrhoids During the first 3 months of pregnancy any form of perineal examination or instrumentation should be avoided lest they should be blamed for a subsequent miscarriage occurring during this period

and even the injection of haemorrhoids should be withheld until the pregnancy is well estashed

In the perperium active treatment of haemorrhoids should be postponed until involution is complete and the levator ani muscle has regained its tone

RECTAL PROLAPSE

By rectal prolapse is understood protrusion of the whole or part of the rectum through the anus When only rectal mucosa prolapses the condition is known as partial prolapse when full thickness of the rectum prolapses the condition is known as complete prolapse It occurs in all ages from infancy to senility Although in adults it is easy to distinguish between partial and complete prolapse in children this differentiation is not always possible because the child cannot or will not prolapse the rectum when required

Prolapse in children

A prolapse occurring in an otherwise healthy child is invariably due to straining in an empty rectum this habit being established by well meaning, bowel conscious parents Correction of this habit invariably leads to a cure and seldom is any surgical interference required and then only of a very minor nature such as submucosal injections or the encerclage of the anus with a catgut suture Rectal prolapse in mentally defective children is a difficult problem They are unable to appreciate the normal stimulus to stool or to co-ordinate voluntary and involuntary effort and it is difficult to train them to do so

Partial prolapse in adults

The commonest cause of partial or mucosal prolapse in adults is confluent haemorrhoids and the prolapse may involve the right or left half of the rectal wall or a complete ring of mucosa may prolapse Predisposing factors are enlargement of the prostate gland senility with loss of sphincter tone and amoebic dysentery The condition is also seen after extensive operations for fistula and the Whitehead type of operation for haemorrhoids As long as care is taken to recognize and treat any predisposing factor the condition is simply treated by excising the redundant mucous membrane

Complete prolapse in adults

The management of complete rectal prolapse is still a difficult surgical problem The condition is not common a large personal experience is unusual and it is exceptional to find identical cases to which one method of treatment would be equally applicable

Treatment

Carefully followed up series of treated cases of rectal prolapse will show that recurrence is common after all methods of treatment that many cases have recurred after repeating the initial treatment and even after applying several methods of treatment in search of a cure Rational treatment should aim at the causes of the prolapse but as these are many and diverse as has already been stated one operation is unlikely to be applicable to all types of cases Keeping in mind the analogy of a rectal prolapse to a sliding hernia a treatment can be evolved on the principle of removing the hernial sac (the recto-vesical or recto-uterine pouch of peritoneum) repairing the internal ring (the levator ani muscle) and narrowing the external ring (the sphincter ani muscle) Methods of treatment are in use applying one or more of these basic steps of herniorrhaphy

Treatment of prolapsed thrombosed haemorrhoids

There is considerable difference of opinion on the management of prolapsed thrombosed haemorrhoids Dissatisfaction with conservative methods of promoting resolution and absorption arises from the fact that complete resolution may take up to 3 weeks, moreover, the haemorrhoids are then still present and may subsequently require injection or removal It is argued by some that if at the beginning of an attack the haemorrhoids are removed the convalescence is that of a standard haemorrhoidectomy, which is no longer than the time required to obtain relief by conservative methods On the other hand operating on prolapsed thrombosed haemorrhoids carries the risk of spreading thrombosis and infection In the past serious infective complications, delayed healing of wounds and even gangrene of the rectum has followed such operations However, infection can now be controlled with antibiotics before and after operation and the risk of infective complications is accordingly diminished Some surgeons, therefore, now elect to operate on thrombosed haemorrhoids On the other hand it is held by others that the risk of spreading localized infection is not justified on the grounds that it may be controlled with antibiotics

Failure of conservative methods is invariably due to delayed and inefficient treatment If the patient seeks relief early the haemorrhoids should be replaced and the patient confined to bed with the foot of the bed raised Lead lotion compresses should be applied to the anus 4 hourly the consistency of the stools should be kept soft with a suitable laxative and the patient given a sedative such as phenobarbitone 30 mg (0 5 gr) 3 times a day The colon and rectum should be empty before replacing the haemorrhoids If as is often the case the rectum is loaded with faecal material this can be simply and quickly evacuated by using a sodium biphosphate enema available in a disposable pack (Harker and Stagg)

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the edges of the puborectalis portion of the levator ani muscles during the course of the operation

It is easier to discuss and describe methods of repairing the levator ani muscles than to put them into practice In long standing cases and in obese elderly women the levator ani muscle may be a completely atrophic fat infiltrated structure with little or no contractile power completely useless for surgical suturing In women therefore where it might be possible to repair the muscle from above and below, there is unfortunately frequently no muscle worth repairing In males where the muscle may be of better quality and receptive to surgical sutures it is not possible to repair the muscle from below and the narrow male pelvis and the structures in relation to the anterior wall of the rectum make the procedure *extremely difficult* from above

Plication and suturing of the external sphincter muscle is never successful in controlling a rectal prolapse The muscle has lost most of its contractile power and is usually so atrophic that its suture could not possibly have any lasting supportive effect The use of silver wire (Thiersch s operation) or other unabsorbable material to narrow the patulous anus and prevent the rectum dropping out has proved to be of great help in many cases Care must be taken to avoid introducing infection when inserting the suture as an absce s or fistula may result The anus should be narrowed to the circumference of a No 18 Hegar's dilator Failure of this method is frequently due to inadequate narrowing of the anus When wire is used it may subsequently break but patients whose prolapse has been controlled by this operation and in whom this happens invariably request replacement of the wire

REMOVAL OR OBLITERATION OF THE HERNIAL SAC (MOSCHCOWITZ)—The hernial sac is the recto-uterine or recto-vesical pouch of peritoneum and the rectum itself usually has a mesentery from the posterior wall of the sac In Moschcowitz original operation this sac was obliterated by a tiered series of circular sutures inserted from the fundus of the sac upwards In all abdominal operations for rectal prolapse it is wise to excise the redundant pelvic peritoneum or imbricate it in such a way that the pelvic peritoneal floor is raised to the level of the brim of the true pelvis In order to strengthen this procedure fascial strips have been sutured across the pelvic brim as a scaffolding for the peritoneum

VENTRAL SUSPENSION OF THE UTERUS—In all cases of rectal prolapse in women wh re the abdominal approach is used some form of ventral fixation of the uterus or vaginal vault should be considered as an additional operative procedure

EXCISION OF THE RECTUM —In some cases where all other methods have failed a surgeon should be prepared to advise the patient to have the rectum excised and a permanent colostomy perform d Patients whose lives have been completely restricted by an uncontrolled rectal prolapse quickly adjust themselves to a colostomy and find that they can once more lead a normal life It is difficult to persuade patients to accept this drastic step but their subsequent gratitude is a reward for the effort required

It is impos ible to treat rectal prolapse as a collective problem The factors responsible for the prolapse must be considered individually in each case It is most likely that a combination of the methods described will offer the best results for good function and freedom from recurrence

and supplementing them as in inguinal hernias with supportive sutures or trans position of tissue

CONSERVATIVE METHODS OF TREATMENT —These consist of controlled sphincter ani exercises correction of faulty bowel habits surging faradism to the sphincter ani muscles and *attention to the general health of the patient Such methods* of treatment could conceivably be successful in the initial stages of a rectal prolapse Characteristically however patients with rectal prolapse do not report the condition until it is well established The fact that when asked to contract *and pull in the rectum* a *patient* with *rectal prolapse frequently* pushes down and relaxes the anal sphincter is evidence that time is well spent in the re education of the sphincter muscle by exercises

These conservative methods are unlikely to be successful by themselves but can be used with benefit as adjuncts to other treatment

AMPUTATION OF THE PROLAPSE OR RECTOSIGMOIDECTOMY —This method of treatment first practised for strangulated gangrenous prolapse and subsequently popularized by Ernest Miles in 1933 has no logical basis It merely consists of cutting off a protruding segment of bowel and like most ablative surgery it is an easy operation requiring no technical skill and carrying a low mortality It has however, its own complications is followed by a recurrence rate of at least 60 per cent and leaves a characteristic rectal dysfunction The method is useful in octogenarians with prolapses from 6–8 inches in length it is not likely to be successful for the short prolapse of 2–3 inches The best results of this operation seen by the author have been in young adult males It must be stated that occasionally a permanent cure of a rectal prolapse with perfect function may be obtained by this method but this is the exception

RECTOPEXY AND SIGMOIDOPEXY —In the past many attempts have been made to fix the rectum by sutures or artificially created adhesions As it is the anterior *wall of the rectum where the prolapse starts it is unlikely that methods directed* at fixing the posterior wall of the rectum will be successful The firm fixation of the rectum that has been observed following an anterior resection for carcinoma has led to this operation being practised recently for rectal prolapse It may be combined with removal of the pelvic peritoneal pouch and ventral suspension of the uterus One disadvantage is that it is a difficult abdominal operation to which one might be unwilling to subject an elderly or obese patient suffering from constitutional disease A second disadvantage is that in young male patients such an operation may result in sexual impotence

The lateral ligaments of the rectum may be defined and detached from their low insertion and be sutured higher up on to the sacral promontory after the rectum has been pulled up taut In women as an alternative slings of fascia or floss silk attached to the sacrotuberous and sacrospinous ligaments over which the anterior wall of the rectum is sutured to the posterior wall of the vagina are inserted as substitutes for, or to strengthen the lateral ligaments

REPAIR OF THE LEVATOR ANI AND SPHINCTER ANI MUSCLES —There is no doubt that the repair of the levator ani muscle, or closing the internal ring of the hernia is the physiological approach to the problem of rectal prolapse Attempts to narrow the opening through this muscle have been made from the abdomen (Roscoe Graham s operation) and from the perineum below (McCann s opera tion) Surgeons who have practised rectosigmoidectomy, conscious of *the* dis appointing results have added to the operation by suturing together or darning

The common bile duct which gets injured is commonly a slim, very mobile duct drawn out of its usual alignment during what is later described as having been an easy cholecystectomy The experienced surgeon will know this well and a careful dissection and display of the relevant anatomy will precede ligation and division of the cystic artery and duct A skilfully administered anaesthetic providing good relaxation and allowing an unhurried operation by an experienced surgeon carries a risk of about 0 5 per cent represented by the unexpected and unpredictable accident such as pulmonary embolism (*see* for example Walters and his colleagues 1955) In these circumstances it is arguable that this small operative hazard is less than the risk the patient would run if the gall stones were to be left where they are

The risk in leaving symptomless gall stones

If the gall stones are left where they are the most significant risk is that of mechanical blockage of the cystic duct or common bile duct with acute or chronic infection or obstructive jaundice occurring as a result This risk is maximal when many small stones are present and minimal when one large stone occupies the fundus of the gall bladder Even the single large stone however can become impacted in Hartmann s pouch and obstruct the gall bladder In the absence of mechanical obstruction infection of the gall bladder wall can nevertheless occur as a result of pressure necrosis and a large stone is just as likely to cause this as small stones In addition to the risks of mechanical blockage and inflammation it is generally considered that the presence of gall stones is concerned in some way with the aetiology of carcinoma of the gall bladder This risk of neoplasia is a very difficult one to assess Carcinoma of the gall bladder is an uncommon variety of cancer even in patients with gall stones though it does appear that the tumour is more common in patients with gall stones than in those without Nevertheless the patient with gall stones probably runs a much greater risk of developing cholecystitis than cancer of the gall bladder

It is almost impossible to estimate with any degree of accuracy what proportion of persons with gall stones remain free from symptoms until death Certainly it is commonplace for a post mortem examination to reveal gall stones unsuspected from the past medical history The personal view of the writer is that gall stones in a middle aged person are rather more likely to give trouble sooner or later than to remain silent until death many years later from some unconnected disease

If silent gall stones are ignored until finally symptoms do occur does the delay jeopardize the success of an operation if one is now advised? The answer to this question must be—yes In optimum circumstances the risks associated with cholecystectomy are minimal The hazard increases with the severity of pathology Unfortunately the first time trouble occurs it does not follow that it will necessarily be on account of a mild episode The first attack may be severe and endanger life for instance acute cholecystitis with the rapid development of a large upper abdominal inflammatory mass or obstructive jaundice with a stone impacted in the terminal common bile duct with resulting cholangitis The risk from surgery once severe secondary pathology of this kind has been allowed to occur is distinctly greater than the risk from cholecystectomy for stones without complications

The advice therefore to be given to a patient with symptomless gall stones must remain a matter of opinion The views of the writer however may be summarized as follows

CHAPTER 7

GALL STONES

RODNEY SMITH

THE patient with gall stones presents a very common problem and specialist advice upon the desirability of operative intervention may be sought from consultant surgeon or physician The results of surgery must be assessed against a background of the hazard involved in leaving the stones where they are In making this comparison of the risks of surgery and the risks of no surgery consideration will naturally be given to the age and physical condition of the patient and the severity of the symptoms produced by the gall stones As regards the clinical presentation patients fall naturally into the following three groups (1) those with symptomless gall stones (2) those with symptomatic gall stones but no major complications, and (3) those presenting with major complications due to gall stones

SYMPTOMLESS GALL STONES

A patient has a fall and is examined radiologically because a fractured rib is suspected There is no fracture but gall stones are seen This is later confirmed by cholecystography but when questioned the patient denies symptoms of any kind referable to the gall bladder What advice should the physician offer?

To answer this question it is necessary to pose two others (1) If the advice given should be ' have an operation ' what operation is implied and what risk does this carry? (2) What are the chances that symptomless gall stones will remain symptomless and if, in fact symptoms do later occur will the success of an operation then recognized as necessary have been jeopardized by the delay?

Type of operation and the risk

If surgery is advised this almost invariably means a cholecystectomy There is only one circumstance in which cholecystotomy and evacuation of stones is to be considered This occurs when symptomless pigment stones are present in the gall bladder of a young patient with familial haemolytic anaemia whose disorder is about to be cured by splenectomy Even here many surgeons prefer a cholecystectomy

The risk accepted is extremely small provided that the operation is performed under optimal conditions The patient may be endangered in the following ways Anaesthesia for an upper abdominal operation requires a skilled anaesthetist attempts to secure effective upper abdominal relaxation by unskilled means carry risk Even in the absence of pathology there are certain surgical hazards, the important one being that of damage to the right hepatic duct or common bile duct or to the hepatic artery or one of its main branches It is a mistake to imagine that damage to these structures can only occur when secondary pathology has obscured the anatomy or when an anatomical anomaly has deceived the operator

to the stones and resulting biliary infection without inquiring too closely into the physiological basis of these symptoms Thus for years backache has been listed as a symptom of cholecystitis Evidence now suggests however that the back ache is due to an associated pancreatitis which may well continue to cause symptoms if the operation is limited to cholecystectomy (The patient is then, of course said to suffer from the post-cholecystectomy syndrome !)

To sum up the patient with symptomatic gall stones is doomed to increasing trouble without surgery and low fat diets and biliary antiseptics will not affect what is essentially a mechanical problem Therefore other things being equal operation is to be advised In most cases the surgery involved will not be complicated or carry a significant risk In a small proportion of cases the operation will be technically difficult on account of secondary pathology and the assessment and treatment of associated conditions such as pancreatitis may require special experience or the use of special diagnostic means

Symptomatic gall stones in the elderly patient

Symptomatic gall stones in a patient who is elderly or in poor health pose a not uncommon problem The operative risk is obviously greater but equally clearly the risk of continuing biliary infection is also greater One risk must be balanced against the other and experience and judgment are required in the assessment of each individual case Certain guiding principles may be put forward In general it is a mistake to refuse any patient a necessary operation solely on account of age A very old patient will stand surgery far better than he will stand prolonged ill health Severe intercurrent disease such as bronchitis and emphysema or severe diabetes mellitus may well weigh the scales against surgery but a particular problem arises in respect of the patient with symptomatic gall stones who suffers from angina pectoris or who has had coronary infarction

It is very well known today that patients with cardiac pain will often improve immeasurably after a cholecystectomy for gall stones It is also well known that the elimination of gall stones may lead to cure or improvement in patients with a severe Stokes Adams syndrome In general therefore if a patient with gall stones also has cardiac symptoms this fact should lead not to the abandonment of all thoughts of an operation but to a reassessment in the light of the possible improvement in the cardiac state which might result from surgery However if an operation is finally considered right it should not be forgotten that a possible hazard in such cases even though a rare one is cardiac arrest on the operating table or during the immediate post operative period It is at least arguable that patients undergoing cholecystectomy on this basis should be admitted to a special centre where apparatus is available so that the operation can be performed with a cardiac monitor and pacemaker attached to give instant warning of impending arrest and to restart the heart if this should occur Evidence suggests that while the risk of cardiac arrest is minimal in the patient with angina or well compensated infarction it is far from negligible in patients with Stokes Adams attacks and in these the provision of a monitor and a pacemaker is mandatory

GALL STONES PRESENTING WITH SOME ACUTE MAJOR COMPLICATION

Not infrequently the patient seeks advice having become acutely ill on account of some major complication The usual complications are acute cholecystitis and obstructive jaundice due to a gall stone in the common bile duct

(1) In optimal conditions in a middle aged patient in average health a cholecystectomy carries a smaller risk than a policy of wait and see

(2) If the patient is, say, over the age of 65 years, or has some intercurrent disease such as chronic bronchitis or diabetes mellitus the risks from surgery clearly rise without a corresponding rise in the likelihood of trouble from the gall stones Indeed advancing years and a reduced expectation of life must mean a smaller chance of symptoms occurring Each patient will have to be considered individually on his merits, but major complicating factors will probably weigh the scales against surgery

(3) Inexperienced surgery competing with mechanical difficulties due to less than adequate anaesthesia means a sharp rise in operative hazards It is admittedly a personal view but if the writer were to discover symptomless gall stones in his own interior, and the surgical conditions available were anything less than optimal he would keep the gall stones

SYMPTOMATIC GALL STONES WITHOUT MAJOR COMPLICATIONS

If good surgery offers a smaller risk to the patient than leaving symptomless gall stones untreated, it would appear that gall stones causing symptoms should always be dealt with surgically This in a sense is true but judgment is still needed when advising a patient whose gall stones have caused biliary colic or cholecystitis for although gall stones which have once caused symptoms are almost certain to cause more and increasing trouble as time goes by the operative risk involved and the surgical skill and experience required are also higher than when a cholecystectomy is carried out for symptomless stones The reasons will become apparent if consideration is given to the type of surgery which may be required

Surgical considerations

At its most favourable the operation will be a cholecystectomy differing but slightly from that performed when stones have caused no trouble However cholecystitis chronic over the years with perhaps intermittent and more acute episodes, leads to structural changes of a variable degree Adhesion of the gall bladder to the greater omentum the transverse colon and the duodenum calls for careful surgical dissection while adhesion to the common bile duct or right hepatic duct may introduce a complication involving real danger An internal fistula between the gall bladder and the duodenum or rarely the colon or much more rarely both duodenum and colon can also result from calculous cholecystitis A grossly adherent gall bladder calls for precise careful surgery A grossly adherent gall bladder when there also exists an anomaly of the extrahepatic ducts or hepatic artery perhaps in a patient who is obese can mean a technically difficult operation even for the most experienced and skilled of operators Again the operation may not be limited to removal of the gall bladder For various reasons the surgeon having removed the gall bladder may decide to open and explore the common bile duct The decision as to whether or not this is necessary is based upon the past history, the findings at operation and possibly on operative cholangiography and the duct will probably require exploration in some 30 per cent of cases (Maingot 1957) A further consideration is the fact that chronic infection in the biliary tract and gall stones are not uncommonly associated with chronic pancreatitis If a patient has pain and gastrointestinal symptoms and is investigated and shown to have gall stones it is tempting to attribute all symptoms

the procedure selected may well be not a cholecystectomy but a cholecystostomy with evacuation of the pus and stones from inside the gall bladder and drainage the intention being to carry out a cholecystectomy at a later date

Gall stone obstructing the common bile duct

The whole question of the management of the jaundiced patient is discussed in Chapter 8 It may merely be stated here that there is no place for non operative treatment or delay in providing surgical relief The risks of surgery are less than the risks of continuing obstruction and ascending infection in the biliary tree

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Acute cholecystitis

It is generally agreed that a patient who has had an attack of acute cholecystitis as a result of gall stones will almost certainly require a cholecystectomy in order to prevent further trouble The question is should the acute episode itself be treated surgically or should it be treated expectantly with the intention of perform ing an elective cholecystectomy at a later date? This is a subject upon which surgeons hold differing views Those who advise against operation during the acute episode argue as follows

Acute cholecystitis will nearly always subside if treated with rest and antibiotics If an operation is performed local inflammation and oedema may make the operation technically difficult and may magnify the hazard of injury to the common bile duct if the junction of cystic and common bile ducts is difficult to display adequately

These arguments have a good deal of force but should not lead to an unquestion ing rejection of surgery in every case It is true that most cases settle down without surgery and that perforation the major hazard is extremely rare except possibly in the aged Nevertheless it is only too common for resolution to be slow and complicated by the development of an inflammatory mass around the gall bladder This eventually resolves but only after a considerable period during which the patient is confined to bed unable to tolerate more than a fluid diet with a rigid upper abdomen and immobilized right diaphragm It must be stressed that medical treatment of acute cholecystitis carries a mortality and a risk of morbidity just as surgical treatment does Secondly it is not true that surgery is always technically difficult Early in the onset of acute cholecystitis the gall bladder itself is inflamed and oedematous The surrounding adhesions, however are filmy and tenuous providing no barrier to dissection and extending only as far as the stone impacted in the gall bladder neck or cystic duct Beyond this the main duct system and in particular the junction of the cystic and common bile ducts can be displayed with no greater difficulty than is usual in an elective cholecystec tomy After a few days however the position is quite different Now the thickened oedematous gall bladder is the centre of a vascular inflammatory mass and the oedema extends retroperitoneally and into the free edge of the lesser omentum to obscure anatomical landmarks and make dissection of the duct system hazardous

The views of the writer are that it is not unreasonable to advise non operative treatment in acute cholecystitis with the intention of investigating and reassessing the problem when the acute episode has subsided However cholecystectomy carried out during the first 1–3 days of the attack is unlikely to carry a higher risk than an elective cholecystectomy and will effectively cut short the attack at its inception thus avoiding prolonged immobilization in bed and a considerable medical hazard particularly in the obese emphysematous patient Recently a man aged 60 years 5 feet 7 inches in height and 18 stones in weight subject to bronchitis and asthma was admitted to hospital 24 hours after the onset of acute cholecystitis When seen he was cyanosed and in acute respiratory embarrass ment It was considered imperative to operate upon this patient who in fact survived cholecystectomy with early ambulation without any trouble After a few days and particularly if an inflammatory mass has already developed non operative treatment is advisable In a small minority of those patients a growing mass and a continuing high pyrexia will lead to delayed surgery in which case

backache followed by deepening jaundice bile in the urine complete absence of bile in the intestine and growing dilatation of the intrahepatic and extrahepatic bile passages often with a palpable tense gall bladder The patient with a cancer of the ampullary region presents with the same kind of story but usually with jaundice preceding pain which is not severe and is sited in the epigastrium and probably originates in the stretched bile passages in the liver

Primary carcinoma of the common hepatic duct is rare but when it does occur produces a clinical picture very like that produced by an ampullary carcinoma except that the obstruction being above the level of the junction of cystic and common bile duct produces not a distended but a collapsed and empty gall bladder Some weight loss is common if jaundice is due to primary malignancy but often does not exceed a few pounds Obstruction of the common bile duct by metastases is likely to be accompanied by other evidence of disseminated carcinoma and in particular marked loss of weight These three—gall stone obstruction primary malignant obstruction and secondary malignant obstruction—provide the vast majority of cases of obstructive jaundice There are in addition certain rarer causes of obstruction such as choledochus cyst and primary benign tumours typically producing jaundice without pain malaise or fever unless complicated by a secondary ascending cholangitis

INVESTIGATIONS

Liver function tests

Biochemical tests can help distinguish between a hepatogenous and an obstructive jaundice The various tests based upon the elevation of the serum *gamma globulin* help to demonstrate damage to liver cell These include the Takata Ara test cephalincholesterol flocculation test and in particular the thymol turbidity test In general a normal thymol turbidity together with a markedly elevated serum alkaline phosphatase indicates an obstructive jaundice whilst an elevated thymol turbidity with a slight elevation of serum alkaline phosphatase suggests a hepatogenous jaundice The distinction is by no means clear-cut and it is not difficult to understand that this must be so

In many cases of hepatitis the local inflammation in the liver leads to swelling and intrahepatic compression of the smaller bile ducts hence a true secondary biliary obstruction Similarly obstruction of the common bile duct may be complicated by ascending cholangitis and this may be severe enough to cause local oedema and vascular engorgement sufficient to interfere with the function of liver cells

Examination of stools

Where malignancy is suspected examination of the stool for occult blood should not be omitted This test is positive in a large proportion of cases of ampullary carcinoma

Duodenal aspirate

Examination of duodenal aspirate for the presence of pancreatic ferments may also be carried out Malignant obstruction of the bile duct is often accompanied by malignant obstruction of the pancreatic duct and complete absence of pancreatic ferments from the duodenum

CHAPTER 8

JAUNDICE

RODNEY SMITH

THE problem to be discussed in this chapter is of importance to physician and surgeon alike Quite simply it is this when should exploration of the abdomen be advised in the case of a jaundiced patient? In seeking an answer, two other questions will require examination (1) In what circumstances will delay in operating prejudice the patient s chances of recovery? (2) In what circumstances can exploration of the abdomen on incorrect indications prove dangerous to the patient?

Various classifications of jaundice are in common use That with perhaps the most direct bearing upon treatment is as follows (1) ' pre hepatic jaundice due to increased haemolysis of red blood cells (2) ' hepatic ' jaundice due to disease of liver cells (3) post hepatic jaundice due to the obstruction of the bile passages

In general haemolytic jaundice may well require surgery after a complete haematological assessment seldom as an emergency Usually a time is chosen and pre operative preparation given both designed to reduce the risk of intervention to a minimum Hepatogenous jaundice should not be treated by exploration of the abdomen for this cannot be effective and may be dangerous Obstructive jaundice, *on the other hand calls for early operation and delay can be harmful* Diagnosis is therefore all important, and if diagnosis were always clear cut there would be no problem

Unfortunately it is often difficult and sometimes impossible to be quite certain which type of jaundice is present and considerable experience and judgment may be required in deciding whether to watch or to intervene in an individual case

DIFFERENTIAL DIAGNOSIS

Haemolytic jaundice does not usually cause difficulty in diagnosis except in the unusual case of the patient with haemolytic jaundice presenting with gall stone obstruction of the common bile duct The common problem is the patient with a jaundice which could be either obstructive or due to hepatocellular disease The clinical features and investigations upon which diagnosis is based are well known Most patients with a virus hepatitis present with malaise nausea and pyrexia which usually precede the onset of clinical jaundice If the jaundice drags on for a number of weeks it tends to run a fluctuant course Pain is not likely to be a prominent feature

In contrast, obstructive jaundice characteristically produces signs and symptoms reflecting the mechanical origin of the complaint Thus the patient with gall *stone obstruction of the common bile duct will often give not only a history going* back some years suggesting biliary pathology but also a recent history of biliary colic followed by relief from severe pain followed by onset of jaundice The patient with cancer of the head of the pancreas usually has pain first particularly

backache followed by deepening jaundice bile in the urine complete absence of bile in the intestine and growing dilatation of the intrahepatic and extrahepatic bile passages often with a palpable tense gall bladder The patient with a cancer of the ampullary region presents with the same kind of story but usually with jaundice preceding pain which is not severe and is sited in the epigastrium and probably originates in the stretched bile passages in the liver

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Liver function tests

Biochemical tests can help distinguish between a hepatogenous and an obstructive jaundice The various tests based upon the elevation of the serum *gamma* globulin help to demonstrate damage to liver cells These include the Takata Ara test cephalincholesterol flocculation test and in particular the thymol turbidity test In general a normal thymol turbidity together with a markedly elevated serum alkaline phosphatase indicates an obstructive jaundice whilst an elevated thymol turbidity with a slight elevation of serum alkaline phosphatase suggests a hepatogenous jaundice The distinction is by no means clear-cut and it is not difficult to understand that this must be so

In many cases of hepatitis the local inflammation in the liver leads to swelling and intrahepatic compression of the smaller bile ducts hence a true secondary biliary obstruction Similarly obstruction of the common bile duct may be complicated by ascending cholangitis and this may be severe enough to cause local oedema and vascular engorgement sufficient to interfere with the function of liver cells

Examination of stools

Where malignancy is suspected examination of the stool for occult blood should not be omitted This test is positive in a large proportion of cases of ampullary carcinoma

Duodenal aspirate

Examination of duodenal aspirate for the presence of pancreatic ferments may also be carried out Malignant obstruction of the bile duct is often accompanied by malignant obstruction of the pancreatic duct and complete absence of pancreatic ferments from the duodenum.

Radiological diagnosis

When the diagnosis is in doubt radiology can sometimes provide evidence of value Plain films should be used to identify radio-opaque gall stones Barium studies of the stomach, duodenum and colon may follow if a malignant biliary obstruction is suspected Cholecystography and intravenous cholangiography will seldom be indicated If jaundice is more than minimal there will be no visualization of bile passages Percutaneous transhepatic cholangiography (Nurick Patey and Whiteside, 1953 Rodney Smith, 1954) should be considered in doubtful cases The technique of this is not difficult Under local anaesthesia a long needle is advanced into the liver with the object of finding a dilated interhepatic bile duct If bile gushes back into the aspirating syringe injection of Hypaque or other contrast medium allows visualization of the bile passages and will show a biliary obstruction very clearly If a dilated obstructed common bile duct is seen the relationship of the block to the duodenum can be shown by giving a little barium by mouth (Rodney Smith 1954) Examinations of this kind will often provide clear, indeed diagnostic pictures but the method is not without hazard When the needle is removed, leakage of bile into the peritoneal cavity may occur and this is dangerous Most surgeons who have used this method of investigation agree that it should only be employed in cases of exceptional difficulty and even in these only if arrangements have been made for an immediate exploratory laparotomy if after the investigation abdominal pain and shock develop

Aspiration biopsy of the liver

Though aspiration biopsy of the liver is of great value in research it is of limited value as a diagnostic aid in cases of jaundice If the clinical and biochemical evidence still leaves the diagnosis in doubt the reason is very likely that the pathology is mixed as may well happen, for instance in a case of hepatitis with sufficient oedema to cause compression and partial obstruction of the smaller intrahepatic bile passages If this be so the liver fragment obtained by aspiration biopsy is likely to give a similarly equivocal histological picture

Before attempting to lay down a logical scheme of management to cover the more common cases encountered it is pertinent now to examine the natural history of the various types of jaundice, and in particular to ask what harm is likely to befall a patient whose obstructive jaundice is not treated surgically or a patient with a hepatogenous jaundice mistakenly subjected to an exploratory laparotomy

INDICATIONS FOR SURGICAL INTERVENTION

Obstructive jaundice

Gall stone obstruction

Obstruction of the common bile duct by a gall stone is almost always partial and intermittent Some bile escapes into the duodenum from time to time and the dilatation of the bile passages is not initially as marked as in malignant obstruction which is usually complete This is off set by the greater liability to ascending cholangitis Excluding for the moment the question of serious ascending biliary infection a gall stone or gall stones in the common bile ducts cause recurrent episodes of jaundice between which the patient appears relatively normal As time goes by however increasing pathological change occurs as a result of bile stasis and chronic infection and with this there is a slow decline in general health

It is clearly important that surgical relief should arrest this downward progress but there is no immediate urgency

If gall stone obstruction is diagnosed beyond doubt early surgery should be undertaken If owing to doubts in diagnosis surgery is delayed by several weeks no irreparable harm is likely to result If now severe ascending cholangitis com plicates gall stone obstruction this can produce a much more urgent situation The seriously ill jaundiced patient runs a high fever usually with rigors Uncon trolled sepsis with the bile passages distended with purulent bile can put the patient s life in jeopardy Temporary improvement with antibiotics is possible but as is invariably the case in surgery it is not possible to bring severe infection fully under control when free drainage is impossible Thus gall stone obstruction with severe ascending cholangitis calls for antibiotics and early surgery and if owing to misdiagnosis there is delay this is likely to be very harmful and may indeed seriously endanger life

Malignant obstruction

Metastatic obstructions of the common bile duct may temporarily yield to a palliative operation of some kind However the patient s illness is mortal and failure to appreciate early that the jaundice is obstructive in character cannot really be said to lose very much Primary malignant jaundice is a different matter Radical surgery can be performed with a favourable long term outlook in a small group of cases It is thus desirable to operate with as little delay as possible Just how serious is a delay of a week or two however? If the tumour is a carcinoma of the head of the pancreas or of the common hepatic duct the outlook is extremely unfavourable even if excision is still possible delay in diagnosis is unlikely to be a crucial factor Carcinoma of the ampulla of Vater is the one lesion in this group which can often be excised with profit Delay will lead to deepening jaundice and a deteriorating patient with the chance of secondary cholangitis complicating the picture

Extension of the malignant lesion locally or by metastasis is not the important hazard of a short delay in undertaking surgery If a tumour is operable on a certain date and 2 weeks later inoperable on account of infiltration or the presence of m tastases this is a very malignant lesion and will not in any event be resected with any likelihood of prolonged survival The risk of delay is that the patient is deteriorating and that he may eventually reach the operating table with an operable lesion but in too poor a shape to withstand more than a palliative short-circuit This risk should not be overestimated With proper supportive measures it is unlikely that a patient with a favourable tumour will lose the chance of a successful resection if watched for a week or two because the diagnosis is uncertain However delay of 1 or 2 months is very different and it should be possible to avoid this

Rare benign lesions with biliary obstruction

These usually cause intermittent jaundice and chronic ill health Unless com plicated by severe ascending infection rapid deterioration is unlikely and surgical intervention though advisable can be delayed for several weeks without undue risk

Hepatogenous jaundice

The medical treatment of hepatogenous jaundice will not be discussed in this

chapter The question of importance is does a general anaesthetic and an exploratory laparotomy carry a significant risk? The answer is in some cases very much so A patient with a mild hepatitis will not be harmed, but if the surgeon mistakenly undertakes a laparotomy because jaundice is deepening and the cause is in fact not biliary obstruction but a severe hepatitis this patient s life may well be in the balance and a precipitate intervention may weigh the scales against him

What rules or general principles can be suggested then for the timing of surgical intervention in cases of jaundice? The writer s views can be summarized as follows

(1) If evidence clearly points to an obstructive jaundice laparotomy should be undertaken after a delay only long enough to prepare the patient properly for operation

(2) The very ill very jaundiced patient rarely presents any difficulty in diagnosis If the cause is biliary obstruction laparotomy is undertaken If unusually the diagnosis is in doubt a mistake can be made either by operating or by failing to operate To operate mistakenly upon a severe hepatitis carries a much higher risk to life than to watch an obstructive jaundice Therefore the very ill patient whose jaundice is of doubtful origin must on no account be subjected to a precipitate laparotomy Treatment on the assumption that a severe hepatitis is present with frequent reassessment is advisable

(3) The most common problem is what to advise in the case of a relatively mild fluctuating jaundice with equivocal clinical and biochemical evidence as to its origin A reasonable programme for a patient falling within this group is as follows

(*a*) Every effort is made by clinical biochemical and radiological means to decide whether the jaundice is hepatogenous or obstructive If the distinction cannot be made treatment is adopted on the assumption that the jaundice is hepatogenous

(*b*) Frequent reassessment follows Let us assume that after 10 days the position is unaltered and doubts are still unresolved Aspiration biopsy of the liver is now carried out If this supports a diagnosis of biliary obstruction laparotomy is undertaken If the report on the biopsy is equivocal medical treatment is continued

(*c*) Frequent reassessment is continued and if after a further 7–10 days the patient is still jaundiced and a biliary obstruction still cannot be excluded a diagnostic exploratory laparotomy is undertaken

Certain individual varieties of jaundice merit special mention

Obstructive jaundice in the infant

What should be done with a baby aged 2 months with a slowly deepening jaundice and tests suggesting biliary obstruction? Many physicians and surgeons mistakenly advise laparotomy but the problem is actually very different from an obstructive jaundice in an adult If in fact laparotomy is performed the findings at operation conform to one of the following three patterns

(1) In spite of the biochemical tests suggesting biliary obstruction no obstruction is found and liver biopsy establishes the cause as an acquired hepatitis the route of infection being via the circulation of the mother in whom the virus has produced minimal symptoms and no jaundice The baby may get better not because of the operation but in spite of it

(2) The jaundice may prove to be obstructive due not to atresia or stenosis of a major bile passage but to blockage of the ducts by sticky inspissated bile

The precise cause of this is not fully understood but most babies in this group recover in the end again not because of the operation but in spite of it for washing out the larger ducts does not unblock the smaller passages The babies in this group who die are usually those operated upon

(3) The jaundice may be obstructive and due to atresia of the bile ducts This atresia may affect the duct ystem at multiple sites or there may be a single site of atresia in the extrahepatic duct system curable by a suitable biliary short circuit True biliary atresia is rare and atresia at a single site amenable to surgical cure is the rarest of all

A policy of early exploration in the e babies will lead to very occasional success in the exceedinglv rare single atresia at the expense of losing a number of babies who might have recovered had surgery not been undertaken These babies should be watched at least until the age of 4–6 months and then only explored if (*a*) complete absence of bile from the intestine at all times is confirmed, and (*b*) the serum bilirubin shows an uninterrupted progressive upward move without any downward trend however temporary during the period under observation

Jaundice due to drugs

Certain drugs such as chlorpromazine can produce jaundice which chemically and biochemically suggests a biliary obstruction Indeed the jaundice is obstructive in character due to blockage of the finer intrahepatic ducts by oedema and exudate In a doubtful case of jaundice the patient should always be questioned about drugs but if the abdomen is explored the extrahepatic bile ducts are likely to be found empty of bile the intrahepatic nature of the obstruction being demonstrated by liver biopsy Little can be done to treat this variety of jaundice which is likely to recover if the responsible drug has been stopped It has been suggested that cortisone and ACTH may possibly hasten recovery

Intrahepatic obstructive jaundice

Quite apart from drugs intrahepatic blockage of the smaller bile ducts may occur as a result of a diffu e inflammatory process of unknown aetiology This leads to a slowly deepening jaundice which is soon shown to be obstructive and laparotomy follows at which empty extrahepatic bile ducts are found and the nature of the pathology is established by liver biopsy Occasionally, duodenal ulceration complicates this variety of jaundice and several cases are recorded of patients first coming under medical care with haematemesis or melaena supervening after several weeks of insidiously developing jaundice

Patients with intrahepatic obstructive jaundice do badly and usually go slowly downhill and die with cholaemia and liver failure Survival for several years jaundiced all the time is however not uncommon

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CHAPTER 9

CHRONIC PANCREATITIS

RODNEY SMITH

THERE is a fairly widely held belief that chronic pancreatitis is a rare disease in Great Britain It is of course uncommon but it is becoming increasingly clear that a fair number of patients with obscure upper abdominal pain or backache associated with gastrointestinal symptoms are in fact suffering from pancreatitis

DIAGNOSIS

Diagnosis is difficult, indeed the most detailed investigation may fail to establish the diagnosis beyond doubt even though subsequent exploratory laparotomy reveals a severely damaged gland Differential diagnosis includes carcinoma of pancreas, stomach or colon peptic ulcer cholecystitis hiatus hernia, and dissecting aneurysm and many patients are referred for a specialist opinion only after a mass of negative information has been obtained from routine investigations

To summarize a difficult and complicated diagnostic problem, the factors taken into account in attempting to establish a diagnosis of chronic pancreatitis may be grouped as follows

(1) *Multiple previous investigations* failing to identify pathology in other viscera sufficient to account for symptoms but perhaps revealing factors known to be concerned in the aetiology of pancreatitis such as biliary tract disease duodenal ulcer duodenitis or duodenal diverticulum or alcoholism

(2) *A known past history of pancreopathy* such as a proved episode of acute pancreatitis or a pancreatic injury

(3) *Gastrointestinal symptoms* the most characteristic pattern being fat intolerance or frank steatorrhoea

(4) *Pancreatic pain* which can be immensely variable in its character distribution and severity, but basically can be divided into the following

(*a*) Pain from high intraductal pressure characteristically a constant nagging aching pain epigastric or subcostal in site

(*b*) Pain from retroperitoneal peripancreatic oedema or inflammation characteristically a constant severe pain often felt in the back and made worse by lying flat

(*c*) Pain from reflex plain muscle spasm characteristically colicky and intermittent

(5) *Variable disturbance of sugar metabolism* hyperglycaemia glycosuria episodic hypoglycaemia True diabetes mellitus is uncommon some degree of disturbance with an abnormal glucose tolerance curve is very common

(6) *Lack of pancreatic ferments in the intestine* which may be shown by the passage of excess fat and undigested meat fibres in the stools and by various tests based upon the analysis of duodenal aspirate under conditions of pancreatic stimulation with insulin or secretin A demonstrable lack of pancreatic ferments

is uncommon unless a severe pancreatitis with a near-complete ductal blockage is present

(7) *Radiological evidence* by plain films may show pancreatic calcification A barium meal or enema may show compression or oedema of the stomach duodenum or rarely the transverse colon Intravenous cholangiography may show associated biliary disease and may also show compression or distortion of the common bile duct in the groove between the head of the pancreas and the duodenum or dilatation of its supraduodenal portion

(8) *Biochemical evidence* If intermittent acute episodes with pyrexia malaise and exacerbation of symptoms occur it may be found that during these some elevation of serum amylase and lipase can be demonstrated Often this elevation is fleeting and easily missed if the estimation is carried out at the wrong moment Apart from the acute episodes abnormal serum amylase or lipase levels are not commonly found in chronic pancreatitis

(9) *Exploratory laparotomy* is the final investigation A patient with incapacitating symptoms considered to be due to chronic pancreatitis but without evidence establishing this diagnosis beyond doubt should be offered the chance of an exploration after explaining that this is undertaken as a final diagnostic investigation

NATURAL HISTORY AND PROGRESS OF THE DISEASE

It is well known that an isolated attack of pancreatitis may be caused in a variety of ways Few would seriously assert today for instance that reflux of bile from the common bile duct into the pancreatic duct is the only aetiological factor of importance A full and accurate assessment of the natural history of chronic pancreatitis and its likely progress without surgical intervention is impossible without a full understanding of aetiology and pathology and unfortunately many doubts and much conflict of opinion exist in respect of these fundamentals

A comprehensive analysis of all clinical and experimental evidence relating to aetiological factors is outside the scope of this chapter Emphasis is laid here upon the interpretation of known facts in terms of treatment The questions which the physician would like answered are as follow

(1) How does a patient with chronic pancreatitis fare if not operated upon? Can the condition be improved by medical treatment without surgery? What are the indications for operation?

(2) If a laparotomy confirms the diagnosis how certain is it that surgery can bring about a cure or significant improvement?

(3) How great a risk in terms of immediate hazard must be accepted in seeking a surgical solution?

(4) How good are the long term results of surgery both as regards freedom from pancreatitis and freedom from morbidity caused by the operation selected?

The outlook without surgery

The severity of chronic pancreatitis varies considerably from case to case and the severity of symptoms in an individual patient varies greatly from time to time In the main however if the diagnosis is correct the disease will prove to be progressive Intermittent attacks of pain and constitutional disturbance become more frequent and more troublesome and the patient soon develops a background of chronic disability Pain becomes practically continuous and chronic

malabsorption leads to loss of weight, anaemia and hypoproteinaemia Destruction of pancreatic parenchyma is followed by replacement with scar tissue and calcification both in the gland substance and in the duct system with the formation of pancreatic calculi Destruction of islet tissue has to be very severe before diabetes mellitus results, but this is a common accompaniment of the later stages of pancreatitis Chronic pancreatitis in its severe, later intractable stages is a very terrible disease *Continuous pain undermines morale, and alcoholism* and drug addiction are common, even if the patient has been warned that alcohol will make his pancreatitis worse Malnutrition leads to gross wasting and with increasing malabsorption a fatty liver and failing hepatic function result Chronic sepsis in the pancreas exacerbates the problem of diabetes, which becomes more and more difficult to control Eventually the patient dies of his chronic disease even if he does not die of an attack of acute pancreatitis—an ever present hazard

Medical treatment has very little place in the management of this disorder There is virtually no evidence to suggest that dietary restrictions and the use of drugs such as Pro Banthine to suppress pancreatic secretion affect the progress of the disease Indeed, there is some evidence that Pro Banthine may reduce the volume of pancreatic juice *without reducing the amount of ferments* secreted, thus, by increasing the concentration and viscosity of the juice it may actually prove harmful (Puestow, 1959)

Indications for surgery

Surgery is indicated in the following two circumstances (1) if the diagnosis of chronic pancreatitis is clear cut, and (2) if the diagnosis is uncertain but the degree of disability is severe and laparotomy is undertaken as a final diagnostic *measure*

SURGICAL TREATMENT

Prospects of a cure with surgery

It is nearly always possible to cure chronic pancreatitis but sometimes only by accepting a considerable operative hazard

Some patients present evidence suggesting that obstruction to the outlet into the duodenum of a common pancreatobiliary channel is an important aetiological *factor If this is the case and if permanent irreversible changes* have not yet occurred in the gland the operation of sphincterotomy is likely to succeed *(Doubilet 1957 Smith 1957 1958) The scarred fibrosed calcified* pancreas with a dilated and perhaps strictured duct system will not respond to a simple procedure of this kind *The surgeon will in the severer case thus have to consider* various more drastic procedures such as the following

TRANSPLANTATION OF THE COMMON BILE DUCT —Undoubtedly this operation succeeds in curing some cases of pancreatitis It seems probable however that it is likely to succeed only in cases which ought to respond well to sphincterotomy and should not therefore be preferred to this procedure which carries a lower risk of mortality and morbidity

OPERATION TO SECURE RETROGRADE DRAINAGE OF THE PANCREATIC DUCT — Several different modifications of technique are available and the choice between these should depend finally upon the type of pathology found (Puestow 1957)

DISTAL PANCREATECTOMY —This operation is particularly applicable to gross pathology in the body or tail with a normal or near normal head

PANCREATODUODENECTOMY —This procedure is particularly applicable to gross pathology in the head of the gland with the distal part less severely affected

A careful assessment of pathology will usually allow the surgeon to make a clear cut decision on the type of surgery capable of bringing about a cure but in a small group of cases the changes in the gland have become so gross that although it is realized that a major resection and ductal anastomosis would probably be successful this procedure is no longer technically possible

AUTONOMIC NERVE DIVISION —This has also been advocated for chronic pan creatitis Various techniques have been described of which the most usual is a bilateral splanchnicectomy This is not a procedure which can have any useful effect upon the pancreatitis itself but it can sometimes markedly reduce pancreatic pain If therefore a gross chronic pancreatitis cannot be successfully treated because advanced pathology has made the local problem an insoluble one and if the patient has severe intractable pain it is justifiable to perform a splanchnic ectomy as a palliative procedure

The operative hazard

If it is considered that the disorder is curable by sphincterotomy the operative risk is extremely small If however advanced pathology is present the more severe procedures carry a far from insignificant hazard Retrograde ductal drainage carries a smaller risk than partial pancreatic resection and distal pan createctomy is far less hazardous than pancreatoduodenectomy It requires the exercise of considerable judgment to decide how great an operative hazard can be accepted in an individual case If symptoms and pathology though progressive are relatively mild and if it is considered that sphincterotomy would probably bring about a cure this operation should be carried out for the patient is endang ered very little by this and the worst that will happen is that continuing pancreatitis necessitates a second more determined attack on the problem

If the advanced pathology suggests to the surgeon that sphincterotomy is certain to fail and particularly if operative pancreatography has shown a strictured pancreatic duct system some variety of retrograde ductal drainage into the jejunum will probably be selected The patient with gross disease in the head of the gland which the surgeon feels cannot be cured by any procedure short of pancreatoduodenectomy presents a truly desperate problem The operation is always one of extreme technical difficulty and the degree of fixity and adhesion of the gland to major blood vessels may be so gross that resection is literally quite impossible The surgeon will certainly give a great deal of thought to the problem before deciding that he must make a determined attempt at carrying out a pan creatoduodenectomy Nevertheless if the disease is not curable by a lesser procedure the miserable state of the patient may well suggest that even a high operative risk must be accepted

A patient with severe constant intractable pain going downhill with steator rhoea malabsorption wasting diabetes mellitus and liver failure cannot merely be refused surgery and although pancreatoduodenectomy in an ill patient of this kind must carry a very high risk it is better by far to accept this risk than to do nothing and watch the patient die

Long term results of surgery

Chronic pancreatitis is curable The long term results are good if a careful assessment has led to the right operation being performed For reasons already given however it is justifiable to perform a sphincterotomy even if it is felt that this procedure carries only the probability of cure In such a case every effort

should be made to secure a good quality operative pancreatogram after catheterization of the pancreatic duct, as a guide for the future if recurrence should later necessitate a further operation The writer has re operated upon several patients relapsing after sphincterotomy and would prefer to do this rather than accept a higher operative risk by routinely subjecting patients who might be cured by sphincterotomy to procedures of greater complexity and hazard

Morbidity of surgery

If a pancreatic resection is undertaken, does this increase the tendency of the disease to cause diabetes mellitus and if so by how much?

Some surgeons have stressed this hazard and suggested that whatever treatment is undertaken sacrifice of pancreatic tissue is to be avoided The writer s experience does not support this view The absolute necessity is to cure the pancreatitis and the risk of exacerbating diabetes mellitus must not be over emphasized A very small amount of relatively normal pancreatic tissue is sufficient to prevent diabetes This has been shown time and again by the patients subjected to subtotal pancreatectomy for cancer who have not developed diabetes Of course, in chronic pancreatitis the surgeon starts with the knowledge that the pancreas is diseased and the patient perhaps already a diabetic or on the verge of becoming diabetic Nevertheless the writer has yet to encounter a patient who has had a pancreatic resection for pancreatitis and has as a result developed diabetes or has had a previously existing diabetes exacerbated The reverse has been the case, for several diabetic patients have had their diabetes improved by pancreatectomy[7]

There need be no surprise that this should be so, for if the part of the pancreas removed is the site of gross inflammation and the part left behind is of reasonable size less severely affected by pathology and placed in circumstances which allow the inflammation and oedema to subside diabetes may well improve One patient of the writer had a subtotal pancreatoduodenectomy the part of the gland retained being about 2 inches of the tail Nevertheless his severe diabetes mellitus was very greatly improved In fact the tail of the gland was the only relatively normal portion and the excised head contained a large abscess The removal of this grossly septic area naturally improved the diabetes just as a patient whose diabetes is out of control because of a septic gangrenous foot will be rapidly stabilized when amputation is carried out

Conclusion

In conclusion it may be repeated that chronic pancreatitis is usually a progressive disease It seems likely that the relatively simple operation of sphincterotomy can reverse the pathological changes in the gland in a certain group of patients if done early Gross pathology however inevitably means difficult surgery with a higher risk It is clearly desirable if diagnosis is certain to bring the condition under surgical treatment without undue delay

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CHAPTER 10

PORTAL HYPERTENSION AND HYPERSPLENISM

ALAN H HUNT

PORTAL HYPERTENSION

PORTAL HYPERTENSION is the term which is now applied to a state of venous hypertension and stasis within the portal tree It results from interference to the flow of portal blood and the obstruction may be either intrahepatic or extrahepatic Cirrhosis of the liver accounts for the majority 308 (or 88 per cent) of 350 personal cases The elevation of venous pressure and the degree of stasis are inconstant depending to some extent on the anatomy of the veins and the rapidity of development of the condition

Natural decompression of the portal system takes place by the formation and enlargement of collateral channels from the portal to the systemic venous circulations These include submucosal veins of the cardiac end of the stomach and the distal oesophagus which become varicose The flow within them changes so that *it is entirely* upwards draining to the azygos hemiazygos and diaphragmatic network of veins

Symptoms and signs

The symptoms and signs in themselves may constitute the surgical indications In under 50 per cent of the cases of cirrhosis referred to the author has surgery been indicated or possible

Haemorrhage

Haemorrhage from the gastro oesophageal varices constitutes the most dramatic and important of the symptoms of portal hypertension and until recently has accounted for the majority of deaths To save more lives it is essential to diagnose that such haemorrhage is coming from bleeding varices and not from a peptic ulcer This is sometimes easy but may be very difficult The clinician must be constantly aware of the possibility although portal hypertension accounts for no more than 7 per cent of cases of alimentary haemorrhage The circumstances of the haemorrhage may help in the diagnosis in that it will probably occur without any previous symptoms of indigestion other than the dyspepsia complained of by cirrhotic patients The amount of blood vomited may be copious bright red and with clots Sometimes it regurgitates into the mouth and is not vomited in the true sense of the word If it is passed as a melaena stool the physician is often surprised at its severity The rapidity of collapse of the patient is usually more abrupt than that seen in cases of peptic ulcer haemorrhage

On physical examination the stigmas of cirrhosis may be present spider naevi palmar blush and foetor hepaticus being the quickest and easiest to detect The liver may be palpably enlarged hard and rounded An enlarged spleen may be

felt though acute haemorrhage causes it to shrink Ascites may be present The advanced cirrhotic may also show other signs such as dilated abdominal veins

The outcome of haemorrhage from gastro oesophageal varices is necessarily very serious for three main reasons First, the bleeding is inclined to be profuse and persistent in itself leading to death Probably 50 per cent or more of those unfortunate patients succumb to their first haemorrhages Secondly the patient is usually a cirrhotic and haemorrhage precipitates an acute decline in liver function Thirdly, the presence of large quantities of the breakdown products of haemoglobin in the alimentary canal may induce a hepatic type of coma from 'protein intoxication' The danger is much greater in the advanced cirrhotic necessitating the most assiduous treatment from the start In arriving at a diagnosis a radiograph of a barium swallow as an emergency in bed may be of the greatest value and is well justified in obscure cases

Congestive splenomegaly and hypersplenism

Portal hypertension is usually accompanied by an enlarged spleen which may become grossly overactive and produce all the symptoms and signs of splenic anaemia with reduction in the number of the red blood cells and the amount of circulating haemoglobin leucopenia and thrombocytopenia There is usually no evidence of reduced haemopoietic activity

Jaundice and ascites in cirrhotic patients

The liver disease follows a characteristic course often with the development of jaundice which may appear to be obstructive in type and ultimately with the appearance of ascites

In portal hypertension therefore there are two parallel developments going forward at the same time one due to the underlying disease cirrhosis and the other related to the state of venous hypertension which in itself is the result of the disease These two are independent in degree in that the inexorable progress of the one may continue without any of the catastrophic manifestations of the other and vice versa The clinician must constantly bear this duality in mind and realize that each aspect of the disease and of the state must be distinguished from other and commoner conditions which cause identical or similar symptoms—peptic ulcer causing alimentary haemorrhage abdominal malignancy, heart failure and renal failure causing ascites biliary obstruction causing jaundice and many other dyscrasias of the haemopoietic system resulting in an anaemia which can easily be confused with that of congestive splenomegaly

Investigations

The investigation of such patients is therefore necessarily elaborate involving radiological examination of the oesophagus and stomach the heart and lungs and usually the kidneys complete examination of the blood including precise grouping tests of liver function including serum bilirubin serum proteins and their electrophoretic pattern and plasma prothrombin and special investigations such as serological tests to exclude syphilis Many other liver tests may help in the diagnosis and in assessing the prognosis such as the flocculation tests brom sulphthalein retention pseudocholinesterase and transaminases Special instrumental tests may also be considered necessary such as oesophagoscopy (to confirm the presence or absence of varices) peritoneoscopy (to exclude malignancy) liver biopsy, sternal puncture and splenic and portal venography

Treatment

It can be stated emphatically that the usual underlying disease cirrhosis, requires medical treatment and that the complicating state portal hypertension may lead to developments requiring surgery

The emergency treatment of haemorrhage

Haemorrhage far and away the most important of these latter developments is usually precipitate and often on the first occasion has to be treated without the assistance of the elaborate programme of investigations outlined above Transfusion and sedation with drugs not toxic to the liver is the first line of treatment As soon as that is seen not to be successful an attempt must be made to stop haemorrhage by oesophageal tamponade using a Sengstaken-Blakemore tube This ingenious device is a triple lumen gastric tube one channel communicating with the stomach one with a rounded balloon which when blown up lies just below the cardia and the third with a long balloon lying within the lower end of the oesophagus It is cruelly large and should only be passed under anaesthesia or in a comatose patient The method is limited because pressure from the balloons in itself leads to ulceration and further haemorrhage They must therefore not be left blown up for more than 24–36 hours This is time enough to enable the clinician to restore blood loss regulate the blood chemistry and prepare for the possible recurrence of the bleeding when the pressure in the balloons is released or on removal of the tube

Close co operation between physician and surgeon is essential because the next step is urgent and imperative surgical intervention

In a fit patient or one who bleeds when undergoing medical treatment following haemorrhage portacaval anastomosis may be considered In the ill patient it is usually best to stop the haemorrhage by under running the varices This can be done either through the chest if there is good evidence that the haemorrhage is oesophageal in origin or through the abdomen if there is any question of the blood coming from gastric varices or from an associated peptic ulcer (which exists in 8 per cent of all cirrhotics) and of course the varices should be ligated through a high gastrotomy incision if the abdomen has already been opened in the erroneous belief that the haemorrhage was from a peptic ulcer Some surgeons favour proximal gastric transection as an emergency and it may even be necessary to resect a bleeding segment of stomach if it is full of varicosities

The precise course of action must therefore be left to the individual surgeon and his assessment of the particular case in relation to his own special abilities The surgeon should not be misled into thinking that any of these operations is as simple as an emergency gastrectomy for peptic ulcer haemorrhage All except for the emergency portacaval anastomosis leave the surgeon with a sense of having made an incomplete job of a difficult situation The portacaval anastomosis on the other hand may leave one with the feeling that too much has been done in the circumstances

The planned treatment to prevent further haemorrhage

If the patient recovers from the initial haemorrhage a plan of treatment must be worked out to prevent a recurrence This offers at least as great a choice of method as outlined above for the treatment of the acute haemorrhage but first it is necessary for the cirrhotic patient to be built up to as good a condition as it is possible to achieve by medical means

If the liver function is reasonable or good at the end of this period of medical treatment (using the level of serum albumin as a guide—it must be at least 3 2 gm. per 100 ml) the best method of preventing further haemorrhage is to construct an anastomosis between the portal and systemic venous systems, thereby de compressing the portal tree and reducing the pressure within the dangerous area of the gastro oesophageal varices Blood flow through these veins will revert to normal The most efficient form of such an anastomosis is between the portal vein and the vena cava—the end to side portacaval anastomosis Properly constructed *it very rarely thromboses unless there is some anomaly present*

Anastomosis between splenic and renal veins—the end to side or end to-end lienorenal anastomosis—is the alternative method and the special circumstances in which it is indicated are considered below under the heading of splenomegaly and hypersplenism ' It probably carries a lower mortality than portacaval anastomosis The stoma is smaller, less efficient and more liable to thrombose This occurs in about 1 in 4 cases when circumstances are favourable and in a higher proportion when they are unfavourable

When neither portal nor splenic vein is available it is necessary to do an oper ation designed to interrupt the portal flow to the bleeding segment by isolating the proximal half of the stomach and the oesophagus up to the level of the arch of the aorta from all vascular communications and then either (1) transecting completely and resuturing the stomach below the cardia or (2) resecting the cardiac half of the stomach These operations can be of exceptional difficulty especially in cases of cirrhosis when the operative death rate is considerable In extrahepatic obstruction on the other hand there has been no death attributable to the operation in 18 cases

Another method which may be of value where no vein is available for anastomosis is the obliteration of varices by sclerosing injections This method has its place, though it is not as permanent or satisfactory as resection or transection

Prophylactic operation

The mere presence of oesophageal varices in a proved cirrhotic patient who has not yet had a haemorrhage may be an indication for operation if the varices are large and the patient s condition such that one haemorrhage would probably prove fatal Present policy however is to watch and see what happens to such patients having taken every possible precaution against haemorrhage but if this conservative and non operative attitude proves to be dangerous a more active line may have to be adopted and portacaval anastomosis done before even the first haemorrhage occurs

The treatment of intractable ascites

When everything possible short of operation has been tried without success for at least 3 months and the condition of the liver is adjudged reasonable portacaval anastomosis should be seriously considered because an effective anastomosis by eliminating the mechanical hydrostatic element in the aetiology of ascites may relieve the condition

The Talma Morison omentopexy the Crosby Cooney button and peritoneal saphenous anastomosis have all had their advocates together with other operations and may do some temporary good A recent and ingenious method of reabsorbing ascitic fluid (mentioned here with circumspection) is the operation of ileoentectropy In this a segment of distal ileum is isolated

from the alimentary canal sutured inside out and left with its mucosal surface open to the peritoneal cavity It is a method which promises possible relief to a small group of patients but is at present strictly under trial

Ligation of the common hepatic artery may sometimes improve portal venous flow through the liver and thereby relieve congestion and allow the elimination of ascitic fluid It should never be done if the patient has bled or if varices are present

The treatment of splenomegaly and hypersplenism

Removal of the spleen as a definitive procedure in itself or as a preliminary to lienorenal anastomosis has to be considered in three circumstances (1) When the spleen is very large and by its bulk contributes to the patient s distress or makes other forms of operative intervention difficult (2) When the spleen is overactive producing anaemia leucopenia or particularly thrombocytopenia and the removal of this element in the patient s illness is considered essential whatever else may be the trouble In both these circumstances splenectomy may be followed by the lienorenal or portacaval anastomosis the latter being a two stage procedure (3) As a preliminary to lienorenal anastomosis when the portal vein is non-existent or unsuitable for anastomosis irrespective of the degree of splenic overactivity in cases of congenital portal vein obliteration or portal thrombosis

At the time of Banti s writings and for many years afterwards splenectomy was considered the method of choice in the treatment of Banti s disease There is no doubt that it is often beneficial It has sometimes been possible to demonstrate by venography and by measuring the speed of flow in the portal system that the naturally occurring collateral channels around the splenic pedicle have been enough in a particular case to decompress the portal tree The portal pressure has been brought down and all symptoms have been relieved by simple splenectomy but such an occurrence is the exception

The positive and most important reason for avoiding simple splenectomy is that it is followed almost invariably by thrombosis of the splenic vein If this happens to be the only channel available for a shunt the one opportunity for effectively decompressing the portal tree has been lost by allowing the vein to be obliterated In addition thrombosis of the portal vein is rendered more likely by splenectomy because of the elevated platelets and the presence of thrombus within one of the roots of the portal tree Portal vein thrombosis has been found in 11 per cent of all cases of cirrhosis and this combination of intrahepatic and extrahepatic obstruction should be allowed for Clear and complete visualization of the whole portal tree perhaps by both splenic and portal venography is necessary before decisions can be made when such decisions depend on the availability of vessels

Jaundice

Jaundice is often obscure in its origin The Van den Bergh reaction and the alkaline phosphatase may indicate an obstruction but it is sometimes not possible to decide the site of the obstruction without operating operative cholangiography usually provides the necessary information If exploration and cholangiography disclose that jaundice is the result of primary cholestatic cirrhosis the surgeon may have to make a difficult decision there and then as to whether to proceed with an operation to reduce portal venous pressure or not Usually however jaundice is a manifestation of the disease rather than the state and should not be regarded as an indication for therapeutic surgery On the other hand when the

obstruction is extrahepatic as in cases of secondary biliary cirrhosis due to strictures or stones in common bile and common hepatic ducts, it is usually clear what has to be done The stricture has to be repaired or the obstruction removed and, if this is a simple matter it should be done first and the operation for portal hypertension done later However, the stricture may have resulted from one or more previous operations on the biliary passages Massive adhesions may cause great difficulty in reaching and exposing such strictures Portal hypertension will render the situation even more perilous on account of haemorrhage Sometimes it becomes quite impossible to approach anywhere near the bile duct until the pressure has been reduced by lienorenal anastomosis This two stage approach, dealing with the portal hypertension first has been advocated by Cole Ireneus and Reynolds (1955) and is well worth while in a few specially difficult cases

Results of operative treatment

In a brief review of the operative methods available for the treatment of portal hypertension the impression may be created that these operations are an ill assorted collection of unphysiological procedures They are however the best available at the present time and when properly applied give great benefit The assortment reflects the complexity of the condition that is being treated and to some extent the immaturity of our methods of assessment It should be recalled that nothing effective was available in the way of surgical treatment for this condition until Whipple (1945) and Blakemore and Lord (1945) at the Presbyterian Hospital, New York published their first series of portal systemic venous anastomoses

Mortality rate

The mortality of these operations depends on the severity of the disease In the mildly cirrhotic patient it is negligible in the moderately cirrhotic about 10 per cent and in the advanced cirrhotic about 30 per cent In the first group the patient s general condition is excellent and the liver function tests are virtually normal in the second group cirrhosis is clinically evident and the tests show some persistent derangement of liver function, and in the third group the patient s life is in a precarious condition from the advanced state of the cirrhosis These figures are not in any way prohibitive in properly selected cases because the alternative prospect is so appalling The patients are not good subjects and very often also suffer from serious disease of other organs

Post operative complications

The immediate post operative complications are first those of any major abdominal or abdominothoracic operation and do not concern us here except that it must be emphasized that everything before and after the operation must be done to build up the patients into the best possible condition Secondly there are those referable to the diseased liver A major operation a long period of anaesthesia and the severing of the flow of portal blood to the liver may lead to hepatic coma especially during the immediate post operative phase Certain specific measures are therefore taken to minimize this risk such as the preparation of the intestine by giving the cirrhotic patients a protein free diet during the two days before operation so that there are no ammoniacal breakdown products to be absorbed Neomycin is also given to sterilize the intestinal canal of proteolytic organisms Thirdly the abnormal state of the portal venous tree predisposes to

thrombosis within the mesenteric vessels or the portal vein itself, so vascular occlusion must be constantly borne in mind in considering the causes of persistent post operative distension or more severe manifestations of intestinal obstruction Also the so-called post splenectomy fever may be due to thrombosis

Results of surgical operations in specific conditions

The effect of a successful shunt operation is to decompress the portal tree thereby causing (1) the gastro-oesophageal varices to collapse so that no further severe bleeding can occur from them (2) the spleen to contract removing the element of overactivity of the spleen from the clinical picture and allowing the cellular content of the blood to return to normal or near normal (3) ascites to disappear

A successful interruption operation will stop bleeding for a period of time which has not yet been determined

Extrahepatic obstruction

By one method or another patients with extrahepatic obstruction can usually be relieved of the effects of portal hypertension but perhaps only after two or more operations In 24 patients with congenital portal vein obliteration 20 (81 per cent) now do not have haemorrhage and most are leading full and normal lives 2 still have haemorrhages of less extent than before and only 2 are dead neither as a result of the operation

Cirrhosis

No surgical procedure can reverse or arrest a progressive pathological condition within the liver The results therefore depend largely on the extent of damage that has already been done to the liver

MILD CIRRHOSIS —In mild cirrhosis (43 patients) the results were excellent 23 out of 27 cas s of shunt operations being successful (82 per cent) and allowing the patients to return to normal life and wo k For those with associated portal and splenic vein obliteration 4 interruption operations have been successful There was no operative death in this group

MODERATE CIRRHOSIS —In moderate cirrhosis (122 patients) 42 out of 73 portal caval or lienorenal anastomoses have been completely successful with another 15 well worth while giving a figure of 78 per cent in which the shunt was undoubt edly of great benefit There were 8 post operative deaths (11 per cent) 8 others died later from liver disease or derived no benefit from the operation

Four patients who had interruption operations all died within a few months of operation and all developed ascites before death

ADVANCED CIRRHOSIS —In advanced cirrhosis only 42 portacaval or lienorenal anastomoses could be done among 155 patients Of these 19 are alive in good health and another 8 derived great benefit from the operation many being able to return to work for more than 1 year The overall success rate is thus 27 or 64 per cent 12 (28 per cent) died during the post operative phase

Ascites

Thirty two ascitic patients with moderate or advanced cirrhosis had shunt operations All the survivors were relieved of their ascites and 23 were able to return to work the average follow up period being 3 years This is a success rate of more than 66 per cent

These figures give some indications of the results that have been achieved during the past 11 years Further study will we hope enable us to improve upon them

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suggesting that a myelotoxic substance is formed in the spleen Such a theory provides another argument in favour of splenectomy

In the management of some of the more malignant conditions associated with hypersplenism the question of radiotherapy rather than splenectomy is often raised Sometimes the response to doses of 600–1 200 roentgen units is good The spleen shrinks and its activity is reduced but it will enlarge again and it is then that it should be removed Further x rays will lead to the formation of perisplenic adhesions and these besides making ultimate splenectomy more difficult may lead to intestinal obstruction as a result of compression of the colon by the enlarging spleen

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HYPERSPLENISM

Overactivity of the spleen may accompany splenomegaly of any type leading to a reduction in the cellular elements of the blood—red cells white cells and platelets—in uncertain proportions so that any one, two or all three deficiencies may be present, to impinge upon or even dominate the clinical picture The hypersplenism may be primary or secondary

Primary

In this condition no cause other than an enlarged spleen can be found to account for the anaemia and the treatment is to remove the spleen In some cases of the primary type leucopenia or thrombocytopenia may develop so rapidly that splenectomy will have to be done almost as an emergency

In other cases splenectomy done for a case of apparently primary splenic anaemia may disclose an unsuspected underlying disease Usually no harm will have been done

Secondary

Secondary hypersplenism covers a wide variety of diseases including myeloid *and lymphatic leukaemia lymphosarcoma, Hodgkin s disease myelosclerotic* anaemia congestive splenomegaly infective or toxic conditions such as malaria or arthritis (Felty s syndrome and Still s disease) and certain other types of haemo lytic anaemia In none of these conditions is splenectomy necessarily imperative Indeed some may argue that the spleen should not be removed for conditions such as leukaemia when its presence or absence cannot affect the ultimate issue The problem in therapy is posed when blood destruction materially exceeds blood formation Hypersplenism by itself may then contribute to the patient s distress and shorten his life and so the spleen should probably be removed Each case must be judged on its merits, and splenectomy should not be deferred until the *terminal phase of the disease*

The spleen may even become so avid for corpuscles that it not only leads to anaemia but reacts in an excessive manner to transfusion of blood or packed cells The patient will then complain of engorgement and tenderness of the spleen in addition to his other troubles In such an extreme case it may be difficult to keep the patient alive with transfusions and splenectomy will bring immediate relief if the patient survives the operation The timing of massive pre operative trans *fusions should be such that there is no interval between the intended peak in the* haemoglobin level and the actual hour of the operation

Splenectomy will improve the state of the blood prolong life make the patient more comfortable restore some degree of activity and by giving a temporary reprieve in malignant cases relieve the strain of fighting a losing battle

Not all the conditions listed above however are inevitably fatal The special problem of congestive splenomegaly for example has already been discussed in considering portal hypertension *In myelosclerotic anaemia the haemopoietic* activity of the bone marrow becomes progressively impaired and is taken over to a certain extent by the spleen and the liver which undergo myeloid metaplasia It may then be argued that a possible source of blood should not be removed but if it is adjudged that blood destruction is in excess of blood formation splenect omy should be done irrespective of these more theoretical considerations

Sometimes the bone marrow in cases of hypersplenism shows hyperactivity and delayed maturation of cells *Splenectomy appears to release these blood cells*

flood stream from time to time from the bowel from the nasopharynx and from transient foci of infection and escape into the urine through the renal glomeruli If the urinary tract is normal these organisms pass through unheralded and seldom cause urinary infection but if there is any abnormality of the urinary system, for example residual urine in the bladder owing to prostatic enlargement then acute or chronic cystitis will develop Though this infection may be controlled it will persist or recur until the residual urine is eliminated and this can only be done by prostatectomy

Diverticula

Bladder neck obstruction is usually followed by hypertrophy of the detrusor muscle and the increased expulsive force working against a progressive obstruction will lead to increased tension in the bladder One effect of this may be back pressure upon the upper urinary tract another may be herniation of the lining epithelium of the bladder through the muscle coats Through the nature of its origin therefore a diverticulum has no musculature in its wall and cannot empty at micturition indeed it becomes more distended and therefore steadily enlarges A diverticulum is an ideal nidus for infection which once established can never b eradicated as long as the diverticulum remains Diverticulectomy and prostatectomy alone provide a chance of cure

When operating upon a patient with a diverticulum resulting from benign hypertrophy the surgeon should remove the diverticulum first and then enucleate the prostate If the prostate is enucleated first there is a possibility that the patient s condition will not allow for the diverticulectomy to be done at the same operation Exposure of the raw prostatic bed to sepsis from the diverticulum may then result in an overwhelming infection

Retention

Acute and chronic retention of urine are sharply separable for they differ in symptomatology significance and treatment

ACUTE RETENTION —This may occur in any patient with prostatic enlargement even though the previous symptoms have been slight it is usually precipitated by a full bladder with no opportunity of emptying it but may occur when alcohol has caused diuresis and its analgesic effect has dulled the desire to micturate until too late Acute suprapubic pain rapidly ensues and the patient in spite of every effort can pass only a few drops at a time He is forced by his extreme distress to seek medical help without delay The diagnosis is self evident—a palpable bladder associated with suprapubic tenderness and severe discomfort is pathognomonic of acute retention The acute tenderness implies that the distension has been rapid and of short duration It is therefore certain that there will have been no effect of back pressure upon and no dilatation of the upper urinary tract to render dangerous the immediate emptying of the distended bladder A catheter should be passed at once

It is not always easy to pass a catheter when the prostate is enlarged and it is desirable to have a detailed procedure clearly in mind The catheter should be boilable and Charrière 16 is a suitable size Gum-elastic catheters are not satisfactory as they cannot be boiled and are almost impossible to sterilize Plastic catheters and semi rigid rubber ones (Tieman) which can be boiled repeatedly are available and both are very suitable A soft rubber catheter can be easily sterilized but it cannot be passed without touching it and the principle that no part of a catheter which enters the urethra or bladder may be touched by hand should be strictly observed

An enlarged prostate will sometimes prevent the passage of a catheter unless it has a marked, or bi-coudé bend at the tip and indeed sometimes even a bi-coudé

CHAPTER 11

PROSTATIC ENLARGEMENT

HARLAND REES

BENIGN HYPERTROPHY

THE prostate enlarges in most men in middle life and continues to do so as the years go by, but the *degree of enlargement bears no direct relationship to the* severity of either symptoms or obstruction Size alone is therefore of no special significance The cause of benign hypertrophy is unknown and no hormonal or biochemical therapy at present available will influence its development The function of the prostate is not fully understood but its secretions form the bulk of the ejaculate and probably play a part in nourishing the spermatozoa possibly also assisting in their maturation The slight acidity of the prostatic secretions aids the motility of the sperms Prostatectomy renders the patient sterile Impotence is not complete but as there is no longer an ejaculation the sexual life of the patient is inadequate and unsatisfactory

There is but little evidence *to support the belief that prostatic hypertrophy* increases libido though this contention has often been put forward in defence of an elderly man who has committed a sexual offence On the other hand the writer has often been struck by the claim of a patient after prostatectomy that he feels very much younger and better in himself This may well be only the result of improved sleep at night and the removal of the weight of an impending operation from his mind but it might be due to ridding him of an ageing influence *from the enlarged prostate*

Complications

Back pressure

Although the prostate is a genital gland the effects of enlargement because of its anatomical position fall entirely upon the urinary system However large the gland may become it very rarely if ever causes rectal symptoms or rectal obstruction *The most serious effect of enlargement* is back pressure upon the upper urinary tract with consequent destruction of the renal parenchyma Prostatic symptoms may have great nuisance value and may even cause ill health as a result of disturbed nights and anxiety but unless obstruction is caused the upper urinary tract will not be damaged and life will not be endangered

The valve like opening of the ureters into the bladder can protect the upper urinary tract from the effects of the bladder distension but their efficiency is very variable *For example one patient may have a grossly distended* bladder yet a normal blood urea and intravenous pyelogram while in another a slight degree of bladder distension may be accompanied by dilatation of the ureters hydrone phrosis and renal damage

Infection

The seriousness of urinary tract infection has been diminished by chemo therapy, but if the underlying cause is an enlarged prostate infection cannot be permanently eliminated by chemotherapy alone Pathogenic organisms enter the

Furthermore the suprapubic tube is liable to rub against the enlarged prostate causing pain along the urethra or haemorrhage from the gland

An alternative is an indwelling Foley catheter a method which many patients find comfortable and easy to manage Drainage can be arranged in a similar way to that described for a suprapubic tube or the catheter can be spigoted during the day and released as required The urethra can tolerate a soft catheter of the Foley type indefinitely and this method of providing prolonged drainage is well worth trying before resorting to a suprapubic cystotomy Every few months the renal function and the general condition of the patient are reviewed and quite commonly after 6 months or 1 year a prostatectomy becomes possible With chemotherapy the earlier attendance of patients with prostatic symptoms and the very high standard of modern anaesthesia few patients require prolonged drainage and very few indeed are deemed permanently unfit for prostatectomy

Any indwelling catheter or suprapubic tube will become blocked with phosphate crystals if not changed every 6–8 weeks A covering antibiotic or sulphonamide should always be given when a catheter is inserted but if a catheter has to remain longer than a few weeks chemotherapy may be discontinued as the urethra and bladder will have acquired a high degree of immunity to the infection introduced by the catheter

Chronic retention of urine with a dilated upper tract and a high blood urea is a very serious condition and even such simple measures as bladder drainage with a Foley catheter or suprapubic cystotomy are followed by increasing uraemia and death in about 15 per cent of cases The cause of death is always an acute ascending infection This high mortality led Hey (1945) to advise immediate prostatectomy without preliminary drainage or even pre operative cystoscopy in all cases of chronic retention no matter how high the blood urea or how heavily infected the urine Since it was the new infection caused by instrumentation that precipitated the lethal pyelonephritis it was held that if this could be avoided the mortality of immediate prostatectomy should be lower than the combined rate for preliminary drainage and subsequent pro tatectomy There is much in this view but experience has shown that immediate prostatectomy upon patients with severely damaged kidneys carries too great a risk even when performed with rigidly aseptic technique and without preliminary instrumentation

The indications for prostatectomy

Prostatectomy is a major operation and should be advised only when there is a definite indication No place whatever exists for prophylactic prostatectomy On the other hand prostatectomy when correctly chosen provides in most cases a complete cure of a dangerous and vexatious condition and in many others amelioration of symptoms and safety from further renal damage there is mortality and morbidity but both have lessened considerably in the last decade The mortality rate for prostatectomy for benign hypertrophy at St Peter s Hospital London over the last 3 years has averaged 3 7 per cent

Now that suprapubic drainage is only very occasionally necessary the post operative discomfort and the stay in hospital are both much less than formerly only the very elderly and those in whom a serious complication has developed require more than 16 days before returning home after prostatectomy

Choice of method

When surgery is advocated the choice between the various operations must be made

catheter will be arrested when this happens a soft catheter threaded over a sharply curved introducer will be necessary Thus three types of catheter should always be available (1) a plastic coudé catheter (or a Tieman catheter) size Charrière 16 (2) a bi coudé plastic catheter size Charrière 16 and (3) a soft rubber catheter (Harris) size Charriere 18, and an introducer

As soon as the diagnosis of acute retention has been made, the tip of the penis should be cleansed with tepid water and soap and the urethra filled with a local anaesthetic such as Xylocaine gel The three catheters are then boiled and lubricated the coudé or the Tieman being tried first If this is held up by the prostate the bi-coudé should be tried and last the Harris catheter on the introducer On the very rare occasions when all three fail exceptional measures must be employed such as suprapubic needle puncture suprapubic cystotomy or immediate prostatectomy

Catheterization in acute retention will often be followed by a return to normal micturition though the fact that the attack has occurred requires further investigation and may well be an indication for prostatectomy If micturition does not ensue the patient may be given another chance by passing a catheter for a second time, but if normal micturition is not resumed after this it is most unlikely that further catheterization will be more successful An indwelling catheter should then be inserted and the patient investigated and prepared for prostatectomy

CHRONIC RETENTION —In chronic retention the patient will have no suprapubic tenderness or discomfort and will complain only of prostatic symptoms such as difficulty, frequency or incontinence Clinical examination will reveal an enlarged but painless bladder often reaching to the umbilicus or above In these patients catheterization will achieve nothing Moreover it may be followed by acute cystitis and if the upper tract is dilated by an ascending pyelonephritis uraemia and death

The present condition of such a patient has followed months of insidious prostatic obstruction but as the patient has no urgent symptoms no hurried treatment is required A full urinary investigation and a careful assessment of the patient s general condition are needed, and then the correct choice of operation for relief *of the bladder neck obstruction can be made An intravenous pyelogram* a blood urea estimation, and examination of a midstream specimen of urine will usually give all the necessary information Each case must be judged on its merits but on general principles if the upper urinary tract has not been unduly damaged the kidneys show evidence of function on intravenous pyelography and the blood urea is below 70 mg per cent then prostatectomy may be advised without preliminary drainage of the bladder On the other hand if the kidneys have suffered severe damage then a prostatectomy without first restoring some degree of recovery to the kidneys will be hazardous In such cases slow decompression of the bladder by an indwelling catheter will often be followed within a few weeks by a marked fall in the blood urea and general improvement in the patient As soon as the kidneys have recovered sufficiently and the patient s general condition is satisfactory prostatectomy may be undertaken

If little or no improvement in renal function follows within a few weeks of decompression of the bladder then severe and possibly irreparable damage has been done to the kidneys and prolonged or even permanent drainage of the bladder will be required The most usual method is by suprapubic cystotomy The urine drains into a bag attached to the patient s thigh during the day and at night it is conveyed from the suprapubic tube by a glass connexion and length of rubber *tubing to a receptacle at the side of the bed* Although some elderly men find this tolerable many find it difficult to manage and very uncomfortable

become a bigger operation than enucleation One further disadvantage is that only the operator can see exactly what is being done and this makes instruction for the junior surgeon difficult Recent important modifications in the design of diathermy apparatus have made the operation easier quicker and less traumatic

Transurethral resection is an essential technique for the urologist but will be chosen in only about 15 per cent of his cases of benign prostatic enlargement requiring surgery

In one or two clinics in Great Britain and in rather more in the United States of Am rica the perineal route is u ed for prostatectomy There does not appear to be any real advantage in this approach and one of the serious complications of pros tatectomy namely incontinence of urine is more common after perineal prostatectomy than after any of the other operations

Summary

Th- following are the indications for prostatectomy in cases due to benign hypertrophy

(1) Acute or chronic retention of urine
(2) Recurrent urinary infection
(3) The presence of a diverticulum
(4) Evidence of back pressure upon the upper urinary tract
(5) Vesical calculus
(6) Residual urine of 5 ounces or more after micturition
(7) Profuse or recurrent haemorrhage from the prostate

It will be noted that prostatectomy is not indicated for symptoms alone fre quency and a poor stream in the absence of one of the above indications will necessitate surgery only in exceptional cases

The complications of prostatectomy

Complications which may follow prostatectomy are best divided into those which can follow any major abdominal operation and those which are directly attributable to removal of the prostate Of the former paralytic ileus is the most common but if watched for diagnosed early and treated vigorously only occasionally gives rise to anxiety Femoral vein thrombosis sometimes occurs and is a serious complication because the leg will seldom recover completely If however oedema is kept to the minimum by firm bandaging as soon as the thrombosis is diagnosed and active exercise begun at the end of a week, and if an elastic stocking w ll fitting from the toes to the upper thigh is worn whenever the patient gets up the recovery will be sufficiently good to permit all but the most energetic activities Anticoagulants are contraindicated after prostatectomy for even though the urine is free of blood the prostatic bed is never healed under 6 weeks and severe haemorrhage can result

Haemorrhage

Haemorrhage at the time of operation can be very severe but the more experi enced the surgeon the less often does it occur If the bleeding cannot be controlled by ligature or diathermy it can always be stopped by packing the prostatic cavity with a gauze roll Some pressure necrosis is caus d which favours sepsis but this is a small price to pay when bleeding is heavy The pack should be removed

Freyer working at St Peter s Hospital was the first surgeon to standardize prostatectomy and in 1907 he reviewed the results of 432 consecutive operations (Freyer 1907) It is astounding that the fatality rate for this series was only 7 per cent especially when one remembers that neither chemotherapy nor intravenous therapy was available In Freyer s operation the prostate was enucleated with the finger tip through the open bladder no attempt being made to secure haemostasis unless bleeding was profuse in which case the prostatic cavity was packed After enucleation a very large rubber tube was left in the bladder to drain the urine and blood into dressings The suprapubic tube was removed when the urine was free of blood usually after 8–12 days the fistula would then close and urethral micturition return

Freyer s operation is safe comparatively quick, and easy to perform but the patient is confined to bed and to hospital longer than when the bladder is not opened at operation

The Freyer operation was modified and altered in minor ways by many surgeons as the years went by but still retained its supreme place in the field of open prostatic surgery until Millin (1945) introduced the retropubic operation Millin decided to approach the prostate directly through its capsule and thereby avoid opening the bladder The prostate can easily be exposed in the retro pubic space and can readily be enucleated when its capsule has been incised Advantages of this approach are (1) the prostatic bed is fully exposed after enucleation and haemostasis can usually be secured (2) as the bladder muscle has not been incised it is not necessary to leave an indwelling catheter for the usual 10 days to ensure healing of the bladder wall As most of the bleeding can be stopped during the operation a soft catheter is all that is required and this can usually be removed within 5 days when urethral micturition will return

The Millin operation is not a radical departure from that of Freyer, as the essential step of the operation—namely enucleation of the prostate—is the same in each case but it does allow much more adequate haemostasis and this in turn permits a soft catheter to be used for drainage instead of a large supra pubic tube From the patient s point of view the absence of a suprapubic fistula is a great step forward There is one serious disadvantage however, to the Millin operation, the catheter requires constant vigilance and skilled attention during the first few days lest it should become blocked but once the urine becomes free of blood the nursing presents no problem It is therefore most inadvisable to perform prostatectomy by Millin s method unless the staff are familiar with the operation, and able to give constant attention to the patient for the first few days after operation

McCarthy (1931) of New York described the transurethral method of prosta tectomy and this is widely used in the United States of America and Canada in the treatment of benign enlargement of the prostate The open operation is preferred in Great Britain unless there is a particular indication for using the resectoscope for example (1) a small middle lobe which requires removal is better treated by transurethral resection (2) Removal of just enough of the prostate to re establish normal micturition in an elderly man is often a less hazardous procedure than enucleation and will often be all that is required to give the patient normal micturition for the remainder of his life (3) A very frail patient might be judged unfit for prostatectomy but able to stand a small resection and if need be a second resection subsequently

The disadvantages of transurethral resection are twofold First haemorrhage from the cut surface may be difficult to control and secondly removal of a prostate even of moderate size requires many individual cuts and is liable to

clearing the catheter with an ounce or two of solution and then sucking out the clot vigorously the bladder can often be freed of clots and emptied If not there is no alternative to preparing the patient for open operation When the patient is anaesthetized but before the operation is begun, it is well worth trying once more to clear the bladder by passing a large metal cannula and using a Bigelow s evacuator instead of a syringe With the bladder open it is not usually possible to find the bleeding vessel but the continuous ooze from the prostatic cavity can always be stopped by packing with a gauze roll The packing is placed around a catheter and the bladder is closed around a suprapubic tube The pack need remain no longer than 72 hours and if there is a recurrence of bleeding, a continuous drip through the catheter and out of the suprapubic tube will prevent a further clot retention

Infection

Different opinions are also held about chemotherapy Infection always follows prostatectomy but the presence of pus cells and organisms in the urine does not necessarily imply any ill effect to the patient and many recover uneventfully without chemotherapy On the other hand the antibiotics if used correctly carry little risk and are a powerful weapon against infection Few of the writer s patients do not have a course of chemotherapy at some stage after prostatectomy

Incontinence

Some degree of incontinence nearly always occurs after removal of the catheter but if the patient has been warned of this probability and assured that it will be transient he will not be unduly worried Within a few days the majority of patients have fairly good control and in most it is all but complete when they return home Caine recently studied the mechanism which maintains continence after prostatectomy Using an image intensifier he made a cineradiograph of the whole act of micturition In most cases the internal sphincter is rendered ineffective by the operation continence being maintained by sphincteric muscle fibres which surround the posterior urethra and not as previously thought by the external sphincter This observation has considerable practical importance for the surgeon need now have no qualms about leaving a widely open bladder neck or cutting a generous wedge from the posterior margin of the internal sphincter to minimize the chance of a post prostatectomy obstruction In a few cases the patient is completely incontinent when the catheter i removed though in the majority of these some degree of control returns within one week Incontinence though slowly improving may persist for several weeks but complete control is the rule in the majority within 3 months

There remains a small but very distressing group of patients whose sphincters never recover completely and who are permanently incontinent to a greater or lesser degree In some of these only a small leak occurs from time to time and though greatly inconvenienced they overcome their disability by wearing an absorbent pad a dribbling bag or a sponge rubber penile clamp For the very few who are completely and permanently incontinent following prostatectomy very little can be done though every effort must be made to find the particular appliance most satisfactory for each Several operations have been devised in an attempt to find a way of restoring continence but none has proved very success ful The aim of these operations has been to compress the urethra enough to prevent the escape of urine whilst the bladder is at rest but not when the bladder is contracting as in micturition

The cause of permanent incontinence after prostatectomy is the destruction of the internal sphincter by the enucleation or by deliberate excision of the posterior

after 72 hours Recent research suggests that the prostate produces an anti coagulant enzyme to aid the motility of the spermatozoa and that it is an excess of this which causes severe haemorrhage, the amount of this enzyme in the prostatic secretion can be measured pre operatively, and the surgeon can therefore be forewarned, though there is as yet no way of neutralizing the enzyme This research work has not been confirmed sufficiently for the investigation to have been adopted for routine use

Blocking of the catheter in the first 48 hours after prostatectomy can be troublesome, and if this is not noticed soon after it occurs the bladder will fill with blood and clot retention may ensue The King s College Hospital drainage bottle is designed so that a nurse can tell immediately if the catheter is draining without lifting the bedclothes or disturbing the patient, but there is no escape from constant observation until the kidneys are secreting and the catheter is draining freely With modern anaesthesia a patient is conscious within an hour or two of the operation and as there is usually little or no nausea he can start drinking soon after his return to bed thus ensuring free drainage of the catheter

Opinions differ on the advisability of routine blood transfusion and intravenous saline solution The patient s blood group must always be determined and a pint of blood cross matched before the operation begins but if the operation is being carried out in an experienced unit where the nursing staff are expert in persuading elderly patients to take much more fluid than they believe to be possible and where the medical officers are sufficiently experienced to recognize at once the need for intravenous therapy should it arise then routine blood transfusion and intravenous saline solution need not be given If there is any doubt, a pint of blood should be given during the operation followed by intravenous saline solution until the patient s oral intake is at the rate of about 5 pints in 24 hours

Secondary haemorrhage

The usual time for a secondary haemorrhage to occur is between the seventh and fourteenth post operative days, but it may occur at any time until healing of the prostatic bed is complete Unless the bleeding is very slight, a catheter (Harris or Foley) should be inserted and free drainage re established a high fluid intake should be encouraged and if necessary, blood transfusion given followed by intravenous saline solution The drainage must be frequently checked and blocking of the catheter immediately dealt with by irrigation if a clot retention is to be avoided

The choice of an irrigating fluid always presents a problem Sterile water taken from a bottle which has been previously opened is never sterile and to irrigate a bladder with a solution made up from such a bottle will only introduce infection On the other hand to use an unopened bottle for each and every bladder wash out could be deemed extravagant The addition of a small quantity of some antiseptic substance is better than nothing but will not make non sterile water safe for bladder irrigation The best way to minimize the introduction of organisms is to avoid washing out the bladder except when the catheter has actually blocked when an irrigation is the lesser of two evils

Clot retention

A clot retention will have to be dealt with from time to time and a well thought out plan of action will give the best chance of avoiding an open operation

A large catheter which will not collapse when the clot is being sucked out (Harris 22 is suitable) should be passed and a good bladder syringe used By alternately

the urethra will usually take a Charrière size 22, though sometimes the narrowest part the terminal half inch, cannot accommodate this size without pressure Occasionally a small suprapubic tube must be inserted into the bladder at the end of a retropubic prostatectomy if the urethra is too small for a catheter of adequate size If a stricture does develop intermittent dilatation will be necessary and will usually effect a cure

Osteitis pubis

Osteitis pubis does not occur exclusively after prostatectomy but this operation is the commonest cause The condition is characterized by severe pain on movement especially *adduction of the thighs and marked tenderness* in the pubic bones The osteomyelitis is not always evident on radiography in the early stages but bone erosion can easily be seen after a week or two Osteitis pubis has two other characteristics it always gets well and it always takes several months to do so Infection probably gains entrance to the pubic bone from an infected haematoma which has not been able to drain satisfactorily through the suprapubic wound No line of treatment gives dramatic results but it may be assumed that the organisms present in the urine are responsible for the osteitis and the appropriate antibiotic is given Early exploration and drainage of the retropubic space has been advocated but as the complication is not common there has been insufficient experience of this method of treatment for its assessment

CARCINOMA OF THE PROSTATE

The discovery by Huggins that stilboestrol caused a carcinoma of the prostate to retrogress was both a profound advance in cancer research and a step forward in the treatment of the disease The underlying principle of Huggins s work is that a carcinoma of the prostate is dependent on a supply of male hormone and if deprived of this hormone the malignant cells degenerate The female hormones the oestrogens produce atrophy of the testes thus destroying the main source of the male hormone Stilboestrol is a synthetic substance with an oestrogen like effect unhappily though it diminishes the supply of androgens and causes marked retrogression of the carcinoma with its metastases the neoplasm is never entirely destroyed Oestrogen therapy is therefore only palliative Its failure to cure carcinoma of the prostate may well be only a failure to eliminate the androgen supply completely for when the supply from the testes becomes reduced the adrenal cortex begins to secrete an androgen and if bilateral adrenalectomy is carried out the pituitary then takes over the manufacture of male hormone The oestrogens have an effect only on the testes and do not appear to inhibit androgen secretion from the adrenals or the pituitary

Diagnosis

The diagnosis of carcinoma of the prostate can be accurately made in the majority of cases by rectal examination. However in an early case the diagnosis is extremely difficult and something more than a clinical impression is desirable before making such a serious diagnosis Since the carcinoma always begins in the part of the gland next to the rectum a biopsy taken with the resectoscope in the early stages is negative Several ingenious instruments have been devised for puncture of the prostate through the perineum but they all carry the same disadvantages that they are difficult to direct precisely to the suspicious area and they may cause bleeding without providing a track for drainage of the blood

Graham described the following method to overcome these disadvantages With the left forefinger in the rectum and palpating the suspicious nodule a small incision

margin of the bladder neck combined with inability of the circular muscle fibres of the posterior urethra to maintain continence on their own Incontinence cannot be linked with a difficult enucleation or any specific operative manoeuvre and probably is not in any way the 'fault' of the surgeon, but rather does it depend upon an intrinsic lack of power in the sphincteric fibres which surround the posterior urethra

Whilst the patient with incontinence is upright or sitting a urinal bag into which the penis fits without any pressure is usually quite satisfactory The bag has a tap at the bottom for emptying and can be comfortably strapped to the side of the leg Such an appliance is quite useless however when the patient lies down as the urine spills back around the penis as soon as the bag is partially filled The Simplic apparatus is the best appliance for nocturnal use consisting of a funnel shaped rubber cone which fits the penis loosely and rubber tubing which conducts the urine as soon as it is voided, to a receptacle at the side of the bed This appliance however depends upon gravity and the patient must ensure a downward slope from the penis to the receptacle For those patients who have only a slight degree of incontinence or an occasional leak a sponge rubber penile clamp of the Cunningham type will control the incontinence and give the patient confidence and security

The most important factor in the management of incontinence is maintenance of the patient s morale and co operation, and this can best be done by the surgeon explaining what has happened and by taking the patient to a good firm where the various appliances can be seen and where the virtues and faults of each can be discussed If the patient is old and unable to help himself, the surgeon must do all the thinking for him

Post prostatectomy obstruction

The posterior urethra in its first part passes through the prostate and this segment is inevitably removed when the gland is enucleated The cut end of the urethra and the epithelium of the bladder grow together across the prostatic cavity reforming the lost segment of the urethra, this takes place in the presence of blood clot and infection the inevitable concomitants of a dead space such as the prostatic cavity after enucleation It is not surprising therefore that from time to time the epithelium of the urethra and bladder neck fail to meet, and instead fibrosis gradually obliterates the opening from the bladder This complication post prostatectomy obstruction manifests itself about a month after the operation when the patient notices a gradual narrowing of the stream If the condition is diagnosed at this early stage dilatation is not usually difficult and it is often successful in restoring an adequate calibre to the bladder neck If however, the fibrosis has developed to the extent that micturition is very difficult and the stream just a dribble, it may be impossible to dilate the bladder neck satisfactorily even under an anaesthetic In such cases open operation should not be delayed The fibrosed bladder neck can be excised and a wide channel to the urethra established Any subsequent stenosis can be prevented by regular observation of the act of micturition and by dilatation if required Those patients who have had to undergo an open operation for post prostatectomy obstruction do well and the prognosis is good

Urethral stricture

An indwelling catheter, if it is larger than the lumen of the urethra causes pressure upon the urethral epithelium which will heal with the formation of a stricture After prostatectomy it is desirable to use as large a catheter as possible, and

its place in the treatment of carcinoma of the prostate Stilboestrol is the drug most commonly used but one of the similar drugs such as ethinyl oestradiol or Tace may be used if the patient does not tolerate stilboestrol The dosage of stilboestrol is still not standardized very small doses can be very effective and very large doses can be given without ill-effect but it is by no means certain what constitutes the optimum dosage

Stilboestrol

If the patient has acute or chronic retention of urine owing to a carcinoma of the prostate or severe pain due to metastases 100 mg of stilboestrol should be given 3 times a day In acute or chronic retention micturition will usually be re-established within 10 days and the relief of severe pain within a week is dramatic As soon as the acute symptoms have subsided the dosage can be halved and after about 6 weeks a maintenance dose of 20 mg 3 times a day will usually be sufficient Stilboestrol therapy causes salt retention and oedema and heart failure are possible sequelae of prolonged therapy The smaller the dose that controls the carcinoma the less likelihood will there be of these effects Heart failure must of course be treated along the usual lines but a drastic reduction of stilboestrol will be necessary as a temporary measure A less important complication of stilboestrol therapy is the growth of breast tissue with some degree of discomfort if the patient is forewarned of the possibility and a temporary reduction is made in the dosage this complication gives little trouble

If stilboestrol is given for a carcinoma of the prostate causing only mild urinary symptoms a dose of 15 mg 3 times a day will usually relieve the symptoms and control the tumour but subsequently the dose will have to be increased Subcapsular orchidectomy will remove all the androgen forming tissue of the testes and theoretically castration should be carried out as soon as the condition is diagnosed but as a similar effect can be achieved by hormone therapy the patient is usually spared this operation in the early stages This humane approach is very understandable but one can never be certain that the patient will continue to take the tablets regularly when the symptoms disappear furthermore atrophy of the testes takes several months to achieve by hormone therapy alone A less sentimental approach to the problem may in the end prove to be better for the patient The effect of stilboestrol is extremely variable but in every case sooner or later the symptoms recur and the carcinoma becomes active again larger doses may give further alleviation for a while but the time comes when oestrogen therapy has no further effect

Treatment of bladder neck obstruction and severe pain

If the carcinoma is producing bladder neck obstruction a transurethral resection will help the patient if metastases in the vertebrae or sacrum are involving the nerve roots and causing severe pain hypophysectomy should be considered this operation having replaced bilateral adrenalectomy (*see* Chapter 35)

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is made through the rectal mucosa down to the nodule With a pair of ethmoid biopsy forceps a piece of tissue is then taken for histological examination In the series reported by Graham (1958) complications have been minor and few

Exfoliative cytology may well find a place in the diagnosis of carcinoma of the prostate for prostatic massage applied to a suspicious area may produce malignant cells in the secretion, which can be identified when suitably stained. The disadvantage of this method is that it is not always possible to get sufficient prostatic secretion and at present only a few pathologists are experienced in this field Estimation of the serum phosphatase has little value in the diagnosis of carcinoma of the prostate for it is rarely if ever raised in the early case and in one third of even the advanced cases with bony metastases it is still within normal limits A therapeutical trial with stilboestrol can provide a very useful guide in a doubtful case

Pathology

Histological examination of the prostate in men who have died without experiencing symptoms attributable to the gland shows malignant change in many over the age of 70 years and in nearly all over the age of 80 years It is believed that the malignant change in some represents a latent phase of the disease and that carcinoma of the prostate should be considered to exist in two forms an active and a latent there being no way of distinguishing between the two at present The fact that two types exist may account for the very variable course of the disease both with and without hormone therapy

Microscopically, the malignant cells appear large irregular and deeply staining with numerous mitoses Histological examination of the same gland after hormone therapy shows degenerating cells which take the stain very poorly and only a few mitoses most of the cells have this atrophic appearance but there are always some which have resisted the destructive influence of the oestrogens and which are clearly viable

Secondary deposits occur most commonly in bone the pelvis and lumbar vertebrae being usually affected The most frequent sites for early metastasis are the areas of bone around the symphysis pubis and around the sacroiliac joints Prostatic metastases are osteosclerotic and appear on the radiograph as localized areas of increased density simulating Paget s disease of bone

Treatment

Surgery

As carcinoma of the prostate develops in the part of the gland which adjoins the posterior capsule it involves the capsule and the lymphatics long before it gives rise to symptoms Once these structures are involved it is too late for surgical cure Surgery is therefore possible in only a very small proportion of cases The operation for removal of a malignant prostate is a much more exten sive procedure than enucleation for benign hypertrophy The prostate the prostatic capsule and the seminal vesicles must be completely ablated, the bladder is then sutured to the cut end of the urethra Only a few of these opera tions have been reported in Great Britain though a larger number have been done in the United States of America

The complications have been great—as one would expect with a major surgical procedure in its early stage—but more serious than this the recurrence rate has been disappointingly high In the vast majority of cases of carcinoma of the prostate therefore the growth when diagnosed is too advanced for surgery As soon as the diagnosis is made oestrogen therapy should be started but not every case of prostatic cancer responds favourably A few appear not to be hor mone dependent and show no improvement A new drug Honvan is reported to act directly upon the malignant cells and not to rely upon hormone dependency for its effect It is best given intravenously but the oral route can be used Not enough is known about the results of Honvan therapy, as yet for assessment of

mention will therefore be made of the management of conditions for which it is chiefly indicated these are stone and renal tuberculosis

Stone

In all cases an estimation of serum and urinary calcium should be undertaken to eliminate serious metabolic diseases such as hyperparathyroidism These must not be missed but their contribution to the problem of stone is numerically small A larger group of patients may be permanently relieved of a tendency to stone formation by removal of the damaged calyx in which stones have been forming This is commonly at the lower pole of the kidney and by its removal the rate of recurrence of stone formation has been reduced to less than 10 per cent (Stewart 1952) Hanley (1950) stressed that the idea that the operation carries a high morb dity is a mistaken one In a review of 150 cases of partial nephrectomy he found that clot retention in the bladder occurred in 12 and the kidney had to be removed afterwards in 2 of these Only 1 patient died as a result of the operation

Renal tuberculosis

The infection is still confined to one kidney in some 80 per cent of patients when first seen Nephro ureterectomy used to offer the only chance of cure but chemotherapy with streptomycin *para* aminosalicylic acid (P A S) and *iso*-nicotinic acid hydrazide (I N A H) is now the basis of treatment Surgery is a valuable adjunct which must be considered after some 3 months of treatment has limited the infection A badly diseased kidney and ureter are still best removed Localized disease such as a simple abscess cavity is often suitable for partial nephrectomy and sometimes has been observed to heal with chemotherapy alone Treatment is maintained for 1–2 years during which time careful watch is kept for reactions to the drugs in use The vestibular damage and skin reactions caused by streptomycin are well known P A S and I N A H may also cause troublesome side effects Either may give rise to nausea and sickness the former to allergic reactions with skin rash and eosinophilia and the latter to psychological disturbance such as marked depression Experience with this regime is still not sufficient to allow quantitative assessment of results Experience has shown already however that we must look more vigilantly than ever for the damaging effects of fibrosis in the healing process which is encouraged by chemotherapy This may cause stricture of the ureter and contracture of the bladder and their management is discussed below in considering reconstructive surgery of those organs

Transplantation of the kidney

The grafting of a whole organ to survive and retain its function is a goal of restorative surgery Deserved publicity has been given to the achievements of Hartwell Harrison working with Merrill at the Peter Bent Brigham Hospital in Boston in several cases of irrecoverable renal failure resulting from chronic nephritis It is therefore appropriate to consider the conditions for success Normally a homograft or tissue transplanted from a donor of the same species is destroyed by the host after some few weeks as a result of an antibody response This short period of survival can be of value for example in massive skin grafts where even temporary cover of a raw surface can affect recovery For a vital organ such as a kidney it is useless The nature of the rejection reaction is being keenly studied for a suitable method of controlling it would allow the grafting

CHAPTER 12

RECONSTRUCTIVE SURGERY IN UROLOGY

JOHN HOPEWELL

SURGERY has long since passed out of the era when only swift ablation of diseased tissue was possible Attention is now directed towards reconstruction and successful restoration or replacement has been carried out for every organ of the urinary tract

THE KIDNEY

Idiopathic hydronephrosis

The treatment of hydronephrosis affords a good example of the change in surgical management The diagnosis is one that is often missed and now that it is usually possible to preserve the kidney it is particularly important that the diagnosis should be made as soon as possible after the onset of symptoms These are usually pain and vomiting or pain alone Symptoms particularly suggesting disorder of the urinary tract are usually absent especially in children who may indeed present no more than a vague constitutional upset with symptoms referable to the gastrointestinal or respiratory tract However the urine usually contains albumin and red cells The diagnosis is confirmed by radiography If the intravenous pyelogram does not give full information a retrograde one may be performed but scrupulous care with asepsis must be taken all instruments being sterilized in the autoclave

Hydronephrosis is progressive and in nearly all cases operation must be advised Formerly the choice would have been for nephrectomy if the opposite kidney were sound but plastic repair is now preferred The complications of infection and obstruction are largely overcome by chemotherapy and through improvements in operative technique notably those recommended by Anderson and Hynes (1949) Reconstructive operation is warranted if secretion into the calyces is demonstrated within 15 minutes on intravenous pyelography and if the renal parenchyma appears to be adequate on surgical exploration Damage more severe than this infection and stone formation still necessitate nephrectomy but it is found possible to save the kidney in about 75 per cent of all young patients Following operation there may be a leak of urine from the wound for 1–2 weeks Subsequently recurrent attacks of infection may occur but the anticipated complication of hypertension is not experienced in practice Anderson reported a mortality of 1 per cent in a series of 100 patients of whom 5 have required nephrectomy so that the operation is one that can be recommended with confidence

Partial nephrectomy

Although partial nephrectomy may scarcely be defined as a restorative procedure it sometimes offers an alternative to complete removal of the kidney and

mention will therefore be made of the management of conditions for which it is chiefly indicated these are stone and renal tuberculosis

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of a functioning organ such as the kidney At the moment, however this can only be done from one to the other of a pair of identical twins

THE URETER

Stone in the ureter

A stone lodged in the ureter is managed expectantly unless (1) there is radiological evidence of suppression of renal function (2) there is marked hydronephrosis, (3) infection supervenes (4) there is intolerable colic, particularly if there is also failure of the stone to advance, or (5) if the radiograph shows a stone too large to negotiate the ureter

Of antispasmodic drugs given for renal colic Probanthine is often disappointing and though scopolamine is more effective pethidine and morphine are the best

Ureteral injury

Injury to the ureter occurs occasionally during operations in the pelvis especially for cancer When the damage is recognized immediate suture of the ureter should be performed Some reports of this form of repair have been disappointing with an incidence of late stricture formation necessitating nephrectomy Nevertheless it can and should give satisfactory results An important detail of technique is in the method of suture which must be by many, very accurately placed interrupted sutures of 0000 chromic catgut on an atraumatic needle Silk stitches in the urinary tract lead to the deposition of stone At any time after a pelvic operation pain in the loin fever and oliguria suggest damage to a ureter though a fistula may be the first evidence to appear Full investigation by pyelography cystoscopy and ureteric catheterization must be carried out to localize the damage The operation which is usually required and which gives satisfactory results is that of reimplantation of the ureter into the bladder Its timing however must be carefully considered The earlier ureteric obstruction is relieved the better and of course damage to both ureters demands immediate steps to secure urinary drainage However when only one ureter is involved and the opposite kidney is sound no attempt at repair should be made which will endanger the patient s life and it must be remembered that immediately after an extensive pelvic excision further operation carries a considerable risk If possible pain and infection should be controlled until the patient is once again fit even if this means the loss of a kidney

During excision of extensive growth when such a length of ureter must be sacrificed that reimplantation into the bladder is impossible nephrectomy will probably be the wisest course If the opposite kidney or ureter is damaged some expedient must be used to allow drainage The use of a segment of ileum to bridge the gap between renal pelvis and bladder is sufficiently established to be preferred to permanent nephrostomy though figures are not yet available for a reasonable estimate of mortality or morbidity

Ureteral stricture

Stricture of the ureter has been met much more frequently since the use of chemotherapy in the treatment of tuberculosis Long strictures involving the upper ureter are most likely to be seen in cases of renal disease severe enough to require *nephrectomy* Short strictures near the vesical junction are not uncommon however, in association with a renal lesion that is being treated by chemotherapy alone Intravenous pyelograms at intervals of 3 months must therefore be done

to allow early recognition before obstruction can damage the kidney beyond recovery Reimplantation of the ureter into the bladder is required

THE BLADDER

Urinary diversion

The greatest problem in reconstruction in the urinary tract has been that of providing for storage and evacuation of the urine when the bladder is incompetent by reason of congenital anomaly or acquired disease Cutaneous ureterostomy depends upon a double external appliance for storage and has been found difficult to perform successfully The most practicable solution is that of diversion of the urine into some segment of the intestinal tract The ureters may be transplanted into the intact colon or anastomosed to an isolated segment of bowel which then acts as an artificial bladder Any such method involves a technically hazardous operation a high incidence of post operative complications and a profound disturbance of physiological function The indications for operation therefore demand most careful consideration

Carcinoma of the bladder

In the adult bladder replacement is most frequently required after total cyst ectomy for carcinoma of the bladder Study of the natural history of the disease shows an average expectation of life of 16¼ months from the first appearance of symptoms (Prout and Marshall 1956) Treatment is needed for the distressing symptoms of the disease as well as in an attempt to prolong life Yet it must be admitted that no method affects the outcome so much as does the inherent mal ignancy of the growth and its depth of penetration at the beginning of treatment Radical surgery carries an operative mortality of at least 10 per cent even in those few centres that have gathered unusual experience of its management For patients who recover from operation it offers at best a 5 year survival rate of only about 20 per cent Moreover these figures cannot even be approached by the occasional operator The indications for radical surgery are therefore strictly limited Pre ferred methods of treatment are by wide local excision by local destruction and interstitial irradiation either across the open bladder or endoscopically and by super voltage radiotherapy However radical surgery will still be judged the best course in some few patients whose physical state warrants a major surgical pro cedure If growth has recurred after irradiation yet remains confined to the bladder wall or at most to local lymphatic tissue radical total cystectomy is indicated Well-differentiated growths tend to be radioresistant If they involve the region of the bladder neck and are extensive—that is much over 5 cm in diameter—radical excision may be the treatment of choice from the outset Wide spread benign papillomatosis and involvement of the bladder in growths arising from neighbouring organs may also require cystectomy

Urinary diversion will then be required It is also indicated as a preliminary to radiotherapy for growths that have caused obstruction of the upper urinary tract and for incurable lesions with intolerable bladder symptoms Choice of method and management of the complications that may arise therefore deserve attention

The problems of urinary diversion into the intestinal tract

The first choice is for transplantation of the ureters into the intact colon for it affords continence with the least operative manipulation Even so the operation is a dangerous one and a mortality as high as 40 per cent for transplantation alone was

found in a large series reviewed by Jacobs and Stirling (1952) The greatest hazard is that of leakage at the anastomosis causing peritonitis Even after successful operation the morbidity is high The complications are stricture of the ureteric stoma ureteric reflux with ascending infection and biochemical disturbances

STRICTURE OF THE STOMA AND REFLUX WITH ASCENDING INFECTION —These two complications pose a problem in surgical technique that need not be considered here An intramural tunnel a wide open anastomosis and a combination of these two methods are all in use *Clinically evident infection, presenting as pyelitis* should be treated by chemotherapy and followed up with intravenous pyelography *to be sure that the ureter is draining freely*

BIOCHEMICAL DISTURBANCES —The biochemical upset is complex involving fluid and acid base balance and the metabolism of calcium and potassium The primary disturbance stems from the reabsorption of urinary constituents by the bowel mucosa (Hopewell 1959) Dehydration and acidosis result the latter being aggravated by the selective absorption of chloride from the colon A degree of acidosis with hyperchloraemia may be seen in as many as 4 out of 5 patients after ureterocolic anastomosis The symptoms are thirst nausea and later vomiting weakness and lethargy The management of this aspect of the disturbance should *begin with advice to all patients that will help to minimize its effects* Fluid should be drunk copiously the rectum frequently evacuated and 4 g of sodium bicarbonate taken daily If thirst and lethargy become more marked double or treble this dose of sodium bicarbonate should be given and a chloride free diet ordered If dehydration is marked or the condition progressive the patient must be admitted to hospital for estimation of electrolytes and carbon dioxide combining power If this falls below 20 volumes of carbon dioxide per cent (approximately 10 mEq per l) intravenous alkali should be given either sodium bicarbonate if a sterile solution is available, or $\frac{1}{6}$ molar lactate

After prolonged acidosis hypocalcaemia or hypokalaemia may occur The former may amount to frank osteomalacia with skeletal pain weakness and stiffness *and radiological detectable decalcification Vitamin D_2 should be given* by mouth in doses adequate to restore a positive calcium balance—that is 10 000 –100,000 units a day (Harrison 1958)

Potassium loss causes weakness amounting to prostration and finally coma It *demands the most careful replacement by oral or intravenous therapy* for it can itself cause renal damage

Isolated segment reservoirs

If renal function is much impaired as shown by raised blood urea and poor concentration on intravenous pyelography the kidneys cannot be expected to take the added load imposed by ureterocolostomy Also if a patient who has undergone the operation *suffers repeated attacks of ascending infection* or biochemical disturbance which is not readily controlled conversion to some other arrangement that will relieve the kidney is called for In these circumstances the urine may be diverted into an isolated segment of the bowel which then acts as a substitute bladder Separated from the intestinal tract these segments do not expose the ureters to high pressure and to bacterial contamination whilst their small mucosal surface limits the reabsorption Two methods have been re explored and found practicable in the last 10 years The isolated ileal segment some 8 inches in length is completely separated from the small intestine whose continuity is then

restored The ureters are anastomosed to the isolated segment the distal end of which is brought out on to the abdominal wall as an ileostomy It is not a continent reservoir and a collecting bag must be worn sealed to the abdominal skin A suitably inconspicuous one is made with a detachable neck that can be kept fixed by adhesive and waterproof strapping for 48 hours with separate bags that are removed for emptying Simple washing in water is the best way of cleaning all parts of the apparatus

Alternatively the isolated rectosigmoid segment may be used and needs no appliance The ureters drain into the rectosigmoid which is separated from the upper sigmoid colon and its proximal end closed blindly The rectum then acts as a urinary reservoir and the upper sigmoid is brought out as a permanent colostomy which represents the price of urinary continence If it can be accepted the method appears to have advantages over the ileal segment, which is liable to complications Indeed these must be watched for with care Intra abdominal emergencies may arise from impairment of blood supply to the loop or obstruction from adhesion or internal herniation Watch must also be kept to ensure that free drainage is taking place from the ileostomy stoma for a stricture will cause urinary retention with the possibilities of infection and reabsorption

This review of the hazards inherent in ureterocolostomy and the more recent isolated segment reservoirs may give an impression that they are too formidable to be faced Whilst their dangers cannot be minimized it should be remembered that their use was at the outset strictly limited to certain patients who could not be satisfactorily treated in any other way With this reservation, and excepting those patients who even with modern anaesthetic methods are beyond hope of standing an operation these methods are found in practice to offer an acceptable form of relief in these difficult cases

Ectopia vesicae

Mayo considered that not more than one third of children born with ectopia vesicae survive their twentieth year without treatment—that is in the wretched state of permanent incontinence Such a condition demands an attempt to provide urinary control and to prolong life Operations to restore function to the ectopic bladder must be regarded as still experimental and the accepted treatment is by ureterocolic anastomosis with subsequent excision of the bladder remnant This form of urinary diversion is chosen because it is the simplest and safest and involves least disturbance to physiological habits of evacuation It may be carried out conveniently at the age of 18 months to 2 years The complications discussed above are notably less frequent when the operation is performed in childhood probably because of the greater ability of the young kidney to adapt itself to an unusual environment The longest survival is one of 43 years In a most comprehensive survey of ureterocolic anastomosis for ectopia vesicae at the Mayo Clinic since 1912 50 per cent had survived their twentieth year This report was based on operations performed before 1930 and it is probable that the expectation of survival offered today is even greater

Spina bifida

Ureterocolic anastomosis cannot be used in spina bifida when the anal sphincter is incompetent Drainage of the urine into an isolated ileal segment has been advocated for the convenience of drainage into a collecting bag worn on the abdominal wall However the incidence of complications is high and the risks are

regarded generally as not warranted for so limited an advantage A sponge rubber penile clamp is advised

Ileocystoplasty

Tuberculosis of the bladder

The small contracted bladder with a capacity of only a few ounces, leading to distressing frequency has always been a problem and it is now relatively more frequent since chemotherapy saves many patients with urinary tuberculosis who would formerly have succumbed The only form of surgical management used to be that of ureterocolic anastomosis but it is clear that the strain that this inflicts upon the kidney is best avoided when that organ has already been severely damaged by infection Recently attempts have been made to enlarge these small bladders with tissue from the small intestine One method is that of Tasker (1953) who opened out a length of ileum into a flat patch and applied this as an insert into the bladder wall With the thickened tissues encountered in chronic tuberculosis disease this may not be feasible and then the best manoeuvre is to anastomose a short isolated length of ileum to the dome of the bladder to form a so called cat s tail segment This might be thought to act as a diverticulum and cause a high residual urine In fact after the act of micturition the ileal loop empties itself fairly completely into the bladder the patient should therefore be instructed to practice double micturition

Interstitial cystitis (Hunner s ulcer)

Interstitial cystitis with its contracted bladder and marked frequency should be managed conservatively for as long as possible with bladder dilatation diathermy and antispasmodic agents When symptoms are no longer tolerable, however bladder enlargement or indeed replacement by an ileal loop is a reasonable undertaking

Vesicovaginal fistula

When the urinary leakage from vesicovaginal fistula is small it is wise to try a period of catheter drainage to allow healing to occur After a few weeks however, and especially when the fistula is seen to be epithelialized the patient should be recommended to undergo operative repair The risks are slight and perfectly acceptable against the burden of catheter life and with accurate definition and repair of the damaged structures the chances of sound closure are very high

URETHRA

Hypospadias

In hypospadias urinary control is fortunately unaffected and the problem is that of constructing a urethra up to the tip of the penis The widely used method of repair is that of Browne (1949) which makes use of a strip of buried skin

Epispadias

Epispadias which may be complicated by incontinence of urine remains a gravely difficult problem The principle of reconstruction is to fashion a channel for the discharge of urine and seminal fluid with a distal opening near to the top of such penile tissue as may exist No method has given good enough results to be regarded in any way as a standard procedure

Urethral stricture

Urethral stricture after complete or extensive partial rupture from trauma is best prevented by early operation to secure accurate anatomical apposition Anti biotics have reduced the problem of fibrosis from extravasation yet where this is marked and associated with much tissue damage urinary drainage and delayed repair are best advised The most difficult late strictures are those resulting from dislocation of the bladder from the membranous urethra in fractures of the pelvis The possibility of successful management in these cases has been demonstrated by Rank (1950) who replaced the urethra by a split skin graft using an indwelling splint for many months to maintain an adequate lumen

An interesting extension of Denis Browne s technique for hypospadias has been its application to the cure of stricture Johanson (1953) saw the possibility of converting a urethral stricture by a long ventral incision into the defect of hypospadias This is then corrected by Denis Browne s method Recourse to this operation is indicated in the fit patient requiring dilatation at intervals more frequent than he can tolerate Although this must vary with the individual it would be reasonable to consider it for a fit man requiring dilatation more often than once in 6 weeks The operation does not have a mortality higher than that inevitably consequent upon operation under general anaesthesia and cure of the stricture can be almost certainly expected

Avulsion of the external genitalia sometimes occurs and reconstruction of the penis has given results sufficiently satisfactory for it to be advised for fit men suffering from this distressing mutilation

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CHAPTER 13

CIRCUMCISION

E W HART, H DAINTREE JOHNSON AND HARLAND REES

HISTORICAL ASPECTS

CIRCUMCISION is one of the oldest practices in existence, indeed, ancient cav paintings suggest that it may date back to the early Stone Age Frazer (1890) in *The Golden Bough* expressed the opinion that it grew out of early tribal fertility rites and was associated with belief in reincarnation, but a secondary origin may have been through degeneration of the primitive custom of emasculation of prisoners of war and slaves The Egyptians employed circumcision over 5 000 years ago, though at first only for warriors and priests According to Herodotus the Jews later copied the custom from the Egyptians, and they then practised it like others, at puberty Some historians hold that it was probably during their exile among the uncircumcised Babylonians that the Jews adopted circumcision as a religious distinguishing badge and transferred its performance to infancy According to the Old Testament Moses introduced circumcision at the command of the Lord while the Jews were wandering in the desert

As well as being of prehistoric origin circumcision is also extraordinarily wide spread, only the Indo Germanic Mongol and Finno Ugri races being unacquainted with it (Hastings 1908-26) The practice is found among indigenous natives of Africa Australia, South and Central America, and Pacific islands Many primitive tribes carry out a form of circumcision at ceremonies of initiation into manhood and some perform an analogous mutilation on girls Of civilized peoples the Jews and the Moslems are required to be circumcised and the rite might have become obligatory for Christians as well had it not been for the opposition of St Paul Only the Abyssinian, among Christian churches, now commands its adherents to be operated upon However though no religious sanction exists many Christian families have continued to hand down the procedure from generation to generation

In the Middle Ages interest in circumcision mainly centered upon its ritualistic aspects and religious significance At a time when holy relics were much prized no less than six monastic establishments in France claimed to have a certain historic prepuce in their possession A number of quaint customs grew up in connexion with the ceremony—one culminated in the ritual consuming of the fragment by the mother, another involved loading the surgical specimen into a firearm which at the climax of the ceremony was discharged into the air by the father amidst general acclamation

In the nineteenth century there were sporadic medical publications extolling circumcision and praising its alleged therapeutic value Claims were made that the operation would cure rheumatism asthma constipation epilepsy dyspepsia apoplexy and heart failure Hutchinson (1855) held that it would protect against infection with syphilis and Remondino (1891) that it reduced the danger of con tracting tuberculosis It was recommended as a treatment for chorea and

epilepsy when this was caused by masturbation (Heckford 1865) Writing as recently as 1940 Lane urged circumcision *in the female* for nervousness frequency of micturition frigidity enuresis and psychoses and advised a search for preputial adhesions in all obscure conditions in women and girl

Even towards the end of the nineteenth century however a few bold writers drew attention to some of the dangers and complications of circumcision Mastin (1881) reported that urethral strictures were common among Jewish children and stated that a conviction existed among Jews that they suffered from a racial narrow ness of the urethra This often required surgical relief which was known among them as their second circumcision Mastin was the first to suspect that this stricturing might be the result of exposing the delicate tissue of the urethral meatus in infancy Berry and Cross (1956) reported that there is indeed a difference between the average meatal calibre of circumcised and uncircumcised males though it is possible that the difference was present before operation

Early in the present century writers began to express doubts about the advantages of circumcision Hamilton and Middleton (1927) condemned its routine use and Lanman (1924) advised against circumcision in the presence of ammoniacal dermatitis previously regarded as an indication for the operation In 1949 an excellent summary of the new attitude by Gairdner attracted much attention Until recently authors were unanimous at least in considering that circumcision discouraged masturbation and many held it to be wise for this reason However, this view is no longer held and psychiatrists have condemned surgical assaults upon the genitals of those already troubled by feelings of insecurity and guilt concerning them (Spock 1942)

Meanwhile other authors were emphasizing the great rarity of carcinoma of the penis among circumcised men while referring to its occasional appearance in uncircumcised Jews (Wolbarst 1932) This is now fully established and of accepted importance for it cannot be explained on the grounds of racial immunity On the other hand racial immunity might be the explanation of the fact asserted by Besse en (1932) that there is also a low incidence of carcinoma of the cervix in Jewish women which this author also attributed to the circumcised state of their husbands Carcinoma of the penis though rare is less rare among Mohammedans than among Jews and this has suggested that perfect protection is only achieved by very early operation Unlike Jewish circumcision the Mohammedan operation is occasionally incomplete and this is another possible explanation

Ewing (1928) stressed the probable importance of smegma, known to contain a carcinogen as the causative agent in neoplasia of both the penis and the cervix Ravich (1942) reported that carcinoma of the prostate gland also has a remarkably low incidence among Jews and wondered whether this fact too should be attributed to circumcision but there are no grounds for taking the suggestion seriously rather does it underline known racial differences in carcinoma incidence

The majority of civilized people who advocate circumcision are unaware of these arguments however and rationalize the procedure on a basis of simple hygiene though a proportion and possibly a large one adhere to the practice in a spirit of conforming to what they believe to be the done thing Many associate the custom with religion but are ignorant of the attitude or absence of one of their own church It is possible that midwives and grandmothers have had at least as large a part in perpetuating the custom among Christians as have fathers though family doctors have certainly made a substantial contribution

THE PRESENT POSITION

MacCarthy, Douglas and Mogford (1952), reporting a survey of 2,428 male children born in 1946 estimated that 24 per cent of the children born in that year in Great Britain were subsequently circumcised About one third of these operations were performed in the first month of life when ' faults and diseases of the prepuce are practically non existent ' the operation may be assumed therefore to have been done for reasons of conviction or custom At this early age there were marked differences between social levels in the frequency of circumcision professional and salaried parents being considerably more addicted to it After the first month when medical advice may have been the predominant factor no difference was observed between classes (Tables I and II) Two-thirds of circumcisions are performed for supposedly medical reasons, though some authorities hold that in the great majority of these instances probably no true surgical indications existed

TABLE I

PROPORTION OF INFANTS CIRCUMCISED DURING THE FIRST MONTH OF LIFE BY SOCIAL CLASS AND PLACE IN THE FAMILY

Social class	Place in family		
	First born	Second born or third born	Later born
Professional and salaried workers	19 8 per cent (192)	25 4 per cent (228)	43 5 per cent (23)
Black coated workers	13 6 per cent (302)	13 5 per cent (275)	7 0 per cent (57)
Manual workers and miscellaneous	11 0 per cent (454)	6 4 per cent (613)	2 8 per cent (284)

(*After* MacCarthy Douglas and Mogford 1952)

TABLE II

PROPORTION OF INFANTS CIRCUMCISED DURING DIFFERENT AGE PERIODS FROM BIRTH to 4 YEARS

Social class	Percentage undergoing circumcision in the following age groups				Total percentage circumcised by the age of 4½ years	Number of infants at risk
	First month	2-3 months	4-6 months	7-51 months		
Professional and salaried workers	23 9	6 3	3 4	5 2	38 8	443
Black-coated workers	12 9	5 8	3 2	5 8	27 7	634
Manual workers and miscellaneous	7 2	5 2	3 1	6 4	21 9	1 351
Weighted average for population	9 3	5 4	3 3	6 1	24 1	

(*After* MacCarthy Douglas and Mogford 1952)

In North America and Canada circumcision is almost routine being often performed by the obstetrician while waiting for the placenta In private practice the operation is sometimes included in an all in fee for obstetrical attendance A boy found by a school doctor not to have been circumcised may be automatically referred to hospital

It is the duty of a medical practitioner if asked for advice on this subject to give it upon the basis of what he believes to be to the best advantage of the health of his patient—and on nothing else He must therefore be aware of the dangers to life and limb both of the operation and of dispensing with it

INDICATIONS AND CONTRAINDICATIONS FOR CIRCUMCISION

The indications for circumcision can be considered as social or medical The social reasons for circumcision may be dictated by parental wish or family custom or in the case of Jewish male infants as a ritual ceremony associated with the naming of the infant and his reception into the faith In the latter instance the circumcision is performed in accordance with Levitical law on the eighth day of life and is contraindicated only in the presence of local infection persistent jaundice or when the infant is ill from some general disease

Mohammedan boys in towns are often circumcised at about the age of 5–6 years but many at twice that age in country districts A barber usually performs the operation and no religious officer takes part Most surgeons are prepared to undertake the operation when requested by a Mohammedan parent in Great Britain

When the operation is to be performed because of strong parental inclination it is best carried out during the neonatal period when an anaesthetic is unnecessary and the infant appears to suffer little pain Although operation is performed on the first day of life in some countries it is usually desirable to wait until after the eighth day when the prothrombin level has returned to normal and the risk of bleeding associated with haemorrhagic disease is passed

ROUTINE CIRCUMCISION

There can be little doubt that circumcision offers dependable prophylaxis against carcinoma of the penis and the earlier in life the operation is performed the more effective it may be in this respect However there are at present only 100–150 deaths per annum from this disease in England and Wales and the average age at death is 70 years The disease therefore accounts for about 1 in 3 500 deaths and 0 2 per cent of fatal cancers in males Since this last proportion was estimated in America at 1 25 per cent in 1935 by Dean the incidence of the disease may be declining As near as may be judged about 1 in 500 uncircumcised men contracts carcinoma of the penis whereas 1 in 5 or 6 succumbs to cancer of some other part Moreover since the disease mainly attacks the aged it does not greatly alter life expectancy

Many surgeons have been struck by the exceptionally low standards of hygiene characteristic of patients with carcinoma of the penis and by the frequency of a history of veneral disease (Dean 1935) Since a main causative agent is almost certainly associated with the presence of smegma simple cleanliness should prove equally as effective in prophylaxis as circumcision indeed the raised standard of living and hygienic facilities are the most probable reasons for the lowered incidence of penile carcinoma. If carcinoma of the cervix were also prompted by smegma which is far from generally accepted the same simple measures should protect both husband and wife

Against these deaths, which might have been avoided by circumcision in infancy must be weighed the operative fatalities and morbidity of circumcision itself Gairdner (1949) estimated that the operation cost the lives of some 16 babies in Great Britain each year Hebrew law recognizes the danger, for it sanctions the omission of circumcision for the third son of parents who have already lost two as a result of the operation In the survey of MacCarthy, Douglas and Mogford (1952), 5 per cent of the circumcisions had led to complications and 1 per cent of the patients required admission to hospital

Though accidental amputation of the glans penis is rare, partial or complete flaying are seen from time to time and such disasters are likely to continue as long as circumcision is done in out patients by casualty officers Nearly everyone who has worked in a hospital has encountered the occasional catastrophe of this kind, and the admission of an almost exsanguinated baby still bleeding dangerously after ritual circumcision is in certain hospitals almost commonplace Moreover, the death of one baby cannot be equated with the death of one old man Not only does tenfold loss of life expectancy result, but the death of a baby may be expected to cost a great deal more anguish Apart from operative trauma painful meatal ulcer and stricture are now well recognized later sequelae of circumcision and these dangers must be balanced against those of balanitis and paraphimosis which are thereby avoided Cellulitis and even gangrene may occasionally be seen after operation

It is doubtful whether the case for routine prophylactic resection of the prepuce in infancy can be sustained on scientific grounds, any more than could a comparable one for routine appendicectomy Indeed by routine appendicectomy at, say the age of 2 years some 850 deaths per year from appendicitis in Great Britain could be avoided The cost in operative mortality would likely be a lot less than this But who would wish his child to undergo the prophylactic operation on that account?

It has been suggested that a child may suffer psychological trauma from finding himself to be different from those around him at boarding school for instance Whether he is circumcised or not, however he is unlikely to be alone in his condition In Britain he has the better chance of being like others if left uncircumcised

MEDICAL REASONS FOR CIRCUMCISION

Phimosis

Most babies who are sent to hospital for circumcision are referred on account of so called phimosis and commonly this is found to mean no more than a non retractile prepuce Hart (1907) described the embryology of the prepuce and showed that it is at first solid with the glans penis being later separated from it by formation of the preputial space Wood Jones (1904) was the first to point out that this process was commonly incomplete at birth and Gairdner (1949) found that it is unusual for full separation to have occurred rendering the foreskin retractable until between the ninth month and third year of life True phimosis is extremely rare in the newborn though according to Gairdner only 4 per cent of babies have retractable prepuces at birth, and in 42 per cent not even the tip of the glans penis can be uncovered However this condition of apparent phimosis resolves spontaneously and completely in the course of a few years, and in most instances if left alone the prepuce becomes readily retractable by puberty

In recent years it has become fashionable for the midwife to retract the foreskin daily during the first week of life and thus alleviate the apparent phimosis and

facilitate cleaning This practice cannot be too strongly condemned it often results in splitting of the prepuce with subsequent scarring and fibrosis and is often the cause of an acquired phimosis It is equally unnecessary to run a probe around the glans to break down preputial adhesions If circumcision is not carried out the foreskin should be left untouched to be freed in due course by natural development Gairdner stated that smegma does not collect behind a non retract able prepuce until after the age of about 5 years This is because smegma cannot form before the preputial space is developed After about 4–5 years however non retractability is seldom, if ever, due to incomplete development of the space By then it is due to true irreversible phimosis which requires treatment by circumcision

Ammoniacal dermatitis

Ammoniacal dermatitis or napkin rash is not infrequent in young infants The wearing of napkins to absorb the urine which is voided is an artificial practice and the constant contact with damp napkins makes the skin of this area very susceptible to irritants of which the commonest is ammonia *Proteus ammoniae* is often present in the colon of infants although the organism thrives poorly in an acid medium and vigorously in an alkaline one Napkins contaminated with this organism cause decomposition of urea with the release of ammonia which impregnates the damp napkin and scalds the skin of the napkin area This effect is enhanced when the napkins are washed with alkaline soap which is not thoroughly rinsed out

Ammoniacal dermatitis causes redness glazing and sometimes blistering of the skin and this may be generalized over the whole napkin area or confined to the foreskin The latter may become redundant, thickened and scabbed and the infant presents with screaming and handling of the genitalia during micturition which occurs unduly frequently

Infants are often referred for circumcision because of ammoniacal dermatitis but it is more truly a contraindication to operation It is better that the damage and scarring caused by the ammonia should fall on the foreskin rather than on the delicate epithelium of the glans penis and urethral meatus Indeed the fore skin was presumably provided by Nature for the very purpose of protecting more tender parts from trauma

It is essential that the dermatitis should be brought under control first of all and that circumcision should be deferred if possible, until the infant no longer wears napkins The basis of treatment is to wash the napkins with neutral soap flakes, avoiding detergents and strong soaps and to ensure that all soap is washed from the napkins with several changes of cold water The final rinsing is carried out with 1/8000 solution of benzalkonium chloride (Roccal) and the antiseptic allowed to dry out in the napkin to prevent growth of the *P ammoniae* The affected area may be protected with a bland ointment to soothe the raw skin and healing is usually rapid

When the dermatitis is of long standing the burning may cause scarring and the preputial orifice may become pin hole with an unyielding white ring of scar tissue around it It is held by many that this is the commonest cause of true phimosis though a very few may be congenital in origin The pink tip of the glans penis cannot be seen at the preputial opening, and during micturition the prepuce is ballooned by urine which is voided in a fine jet or slow trickle This leads to a risk of back pressure in the renal tract and the development of

hydronephrosis or chronic urinary infection, and surgical relief is indicated Though minor degrees of fibrosis can still resolve spontaneously, more severe scarring may lead to a permanently non retractable foreskin Preputial hygiene is then impossible and retained smegma may promote balanitis preputial calculi and, later, carci noma Once the condition is plainly irreversible circumcision should be advised

If an infant who has already been circumcised develops ammoniacal dermatitis, *prompt treatment is essential to prevent the development of meatal ulceration* and stenosis and if circumcision has to be undertaken when napkins are still being used these should be prophylactically treated with antiseptic as described

Balanitis

Balanitis is uncommon in young infants and children and is usually due to irritation from retained smegma or low grade infection behind a non retractable prepuce The condition usually responds to local treatment but if recurrent is an indication for circumcision when the local condition is under control Most if not all, patients with balanitis have true fibrous phimosis and permanent non retractability of the prepuce requiring circumcision on its own account

Paraphimosis

Paraphimosis is also a complication of a mild degree of preputial scarring The prepuce is retractile but the ring of scar tissue becomes trapped behind the corona of a tumescent glans penis Oedema then develops distal to the constriction and retraction becomes more difficult or impossible In the early stages a para phimosis may usually be relieved by manipulation If this is unsuccessful the distal oedema should be reduced with firm elastic bandaging In a late case it may prove necessary to divide the constricting ring under general anaesthesia. The best procedure is to admit the patient to hospital and perform circumcision forthwith In any case after an attack of paraphimosis circumcision is undertaken to prevent recurrence

Family history of carcinoma of the penis

A family history of carcinoma of the penis would be accepted by most surgeons as a reason for recommending circumcision

SUMMARY

In the opinion of the authors there is no adequate case for recommending routine circumcision moreover there are definite drawbacks and dangers in its use

True phimosis is rarely congenital The scarring which causes acquired phimosis arises from the trauma of attempted retraction in infancy and from ammoniacal dermatitis Non retractability of the prepuce so often mistaken for phimosis may be depended upon to resolve spontaneously

The surgical indications for circumcision are true phimosis marked enough to hinder micturition, irreversible fibrous stenosis particularly when causing non retractability of the prepuce after the age of 4 years recurrent balanitis and paraphimosis

All other interference with the prepuces of young infants is strongly condemned

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CHAPTER 14

INFERTILITY

HOWARD G HANLEY AND JOCELYN MOORE

INTRODUCTION

Management of the subfertile couple

FERTILITY varies within wide limits in healthy normal people, and decreases steadily with advancing years in both sexes a fact which is not generally appreciated so far as the male is concerned It is also not sufficiently realized that the male is responsible for a subfertile union as often as his female partner

If conception has not occurred after 1 year of normal cohabitation without contraception sympathetic medical advice should be sought By this means gross anatomical or psychological defects in either partner can be detected while evidence of definite male subfertility can be excluded In the absence of such *obvious factors one cannot assume that a marriage is subfertile under 2 or* at the most 3 years, but after this time a much more searching investigation is necessary

The investigation of a complaint of subfertility begins with the taking of a history and an assessment of the extent of the opportunity which has occurred for conception In some cases it is found that all that is required is advice on coitus and the timing of ovulation which in a majority of women occurs between the twelfth and seventeenth days after the beginning of the menstrual loss If further investigation is deemed advisable it should begin with the male partner where tests are simple, and more positive than those used for the female which are sometimes unpleasant and not without morbidity

INFERTILITY IN THE MALE

Though the male is investigated first it is essential to appreciate that the surgeon cannot assess the indications for surgery in the male without the full co operation of the gynaecologist and without at least two semen analyses performed by an expert who is interested in the subject—not the junior laboratory technician

The general public s growing concern with this problem is shown by the increasing number of subfertility clinics which have been established since the war This has resulted in a marked increase in the number of subfertile male patients referred to the surgeon for help and advice so that it becomes most important for us to have clearly in mind just what surgery has to offer

Two main groups of subfertile males are referred to the surgeon Those with some *anatomical or psychological disability affecting proper sexual intercourse* and those with apparently normal anatomy, but having a proven semen deficiency

It is still necessary to stress that investigation of the male begins not with a semen analysis, but with a clinical examination Evidence of general ill health and debility, thyrotoxicosis tuberculosis and so forth having been excluded, the genital system is considered

History

Points of special importance are late descent of the testes a history of inguinal or scrotal operations mumps tuberculosis gonorrhoea syphilis or any other incidents of pain or swelling in the scrotum any of which may damage fertility *Bacillus coli* pyelitis and cystitis have no effect on fertility while an epididymitis does not necessarily do so

Examination

Inguinal and scrotal scars

The clinical examination may reveal surgical scars in the inguinal or scrotal region and it should not be forgotten that serious damage to the vas or other structures can follow hernia or hydrocele operations especially when performed in infancy

Abnormalities of the penis and urethra

Epispadias may prevent effective coitus as may also chordee but minor degrees of hypospadias are less important

Undescended testis

If one testis is normally descended non-descent of the other is compatible with normal fertility but bilateral non-descent in the adult implies absolute and incurable infertility Surgical correction at or after puberty is useless but prophylactic surgery in childhood can prevent some of these tragedies in later life

Small or atrophic testis

The commonest causes of a small or atrophic testicle are delayed descent torsion or mumps orchitis These can all result in subfertility or if bilateral in sterility Treatment must be prophylactic since nothing can be done for established testicular atrophy

Epididymal cysts and spermatoceles

It is doubtful whether there is any point in making a clinical differentiation between epididymal cysts and spermatoceles since they both arise in connexion with the epididymis The spermatoceles communicating with the tubular system have milky fluid containing spermatozoa or their precursors while those derived from the paradidymis (epididymal cysts) contain clear fluid without spermatozoa The spermatoceles may be single and often larger than the testicle itself but epididymal cysts are small and generally multiple often bilateral and occur later in life

Surgery for either of these conditions is best avoided in a young man who is still interested in procreation The writer has encountered several cases of sterility which had followed the removal of bilateral cystic swellings of the testicle and the possibility that the operation had caused the sterility could not be excluded (Hanley and Hodges 1959) In later life these cysts may enlarge and become a nuisance in which case they can then be excised with impunity

Chronic epididymitis

A nodular epididymis indicates old chronic inflammatory changes and is a not uncommon finding in late middle age In young men it may have an important

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a testicle after a biopsy without encountering adhesions and sometimes these have obliterated the tunica vaginalis thus rendering anastomotic surgery extremely difficult even in certain instances impossible Five cases of testicular atrophy have been encountered which had followed puncture biopsy

The indications for testicular biopsy as a preliminary diagnostic procedure designed to help the patient are practically non existent If the patient is oligo spermic repeated semen analyses will give information of much greater value than will the histology of the testicle If the patient is azoospermic it can be argued that a biopsy will differentiate between a failure of spermatogenesis and some obstructive element which may possibly be overcome by surgery Unfortu nately this is only partially true The author has yet to see a biopsy from a clinically well developed testicle which did not show some evidence of spermato-genesis while in the case of the small soft testicle where we really do require help in making a decision the biopsy picture may be very misleading Several men have been encountered with sperm densities ranging up to 5 million per ml where the biopsy sections presented a picture in keeping with almost complete azoo spermia With regard to obstruction the biopsy will not tell us whether the blockage is situated at or below the vasa efferentia that is to say whether sperms are entering the epididymis or not and this is the one vital piece of information which the surgeon requires

However from the academic standpoint biopsy studies if carefully correlated with the clinical findings may well provide some useful basis for clinical research and a biopsy should be performed whenever a subfertile testicle is surgically explored This open biopsy performed during exploratory surgery is perfectly safe provided haemastasis is complete

In brief a biopsy will provide very little further help in deciding whether to operate on a testicle or not Added to this is the fact that a biopsy is not without morbidity and may render subsequent surgery difficult if not impossible

It cannot be repeated too often that a series of semen analyses carried out by an expert provides the most important information obtainable in the study of male fertility

Seminal vesiculography

The surgeon who is asked to perform this investigation should also know whether it is designed (*a*) to assist the patient with his subfertility problem or (*b*) to provide other medical academic or research information It is important therefore to understand what information we require and what information the procedure will provide

There is a widespread but mistaken belief that catheterization of the ejaculatory ducts is necessary in azoospermic cases to exclude an obstruction in the prostato vesicular region

In the first place inability to catheterize the ducts means nothing while a success ful radiograph merely confirms the presence of a vesicle a fact which can be ascertained from the semen analysis If there is a normal ejaculate volume the common ejaculatory duct and vesicle on one side at least must be present and paten* Since it is very rarely possible to outline the ampulla of the vas radio logically a seminal vesiculogram in the presence of a normal ejaculate volume provides no new information of value to the subfertile patient and is an unjustifiable procedure

bearing on fertility as indicating evidence of a previous posterior urethritis or a prostatovesiculitis A urethral stricture resulting from an old urethritis may cause subfertility due to retrograde ejaculation into the bladder An old unilateral epididymitis rarely causes any subfertility unless it be due to tuberculosis when the prostate and vesicles are almost always severely involved

A pyospermia particularly if associated with a reduced ejaculate volume should always be suspected of being tuberculous even if both epididymides appear to be clinically normal The pyospermia due to a chronic non specific prostatovesiculitis may interfere with the survival and motility of the sperms but can usually be treated effectively with Gantrisin or sulphonamides

Swellings of the body of the testicle

Any swelling confined to the body of the testicle is a neoplasm until proved to be otherwise The writer has encountered three neoplasms in the course of routine examinations for subfertility Treatment is a matter of the greatest urgency if the patient s life is to be saved If the surgeon cannot be absolutely sure that a swelling is not a growth the testicle must be explored surgically By following this principle mistakes may be made but they will always be on the correct side (Stephen 1958) Gummatous orchitis in a young man is a very rare finding today and is most likely to have resulted from congenital syphilis so that other stigmata should be sought for

Varicocele and hydrocele

The ordinary large tense, idiopathic hydrocele is uncommon before middle life However a younger man may be found to have a soft lax hydrocele and either this or a varicocele may upset the delicate temperature regulation of the testis, essential to normal spermatogenesis These two lesions are considered further under Oligospermia '

Laboratory *investigation*

After the clinical examination a semen analysis should be performed by an expert semenologist The most reliable information can be gained from a fresh specimen ejaculated into a sterile plastic container A condom specimen is useless The semenologist must know the exact time of ejaculation whether the whole ejaculate was collected, and the period of continence preceding the examination

When on psychological or religious grounds a fresh specimen of semen is not available one must make do with a sample of the vaginal secretions collected as soon as possible after coitus (Rodriguez Villa) though this is far from satisfactory

Testicular biopsy

One of the commonest procedures which the surgeon is asked to perform is a testicular biopsy, and he should fully appreciate the dangers and morbidity of the procedure as compared with the value of the information to be obtained

There are two reasons for performing a testicular biopsy (*a*) to provide information which may help in the treatment of a particular subfertile patient and (*b*) to provide information of academic interest or for research purposes It is therefore most important to be perfectly sure what one is doing a biopsy for because the procedure is not without morbidity The author has rarely explored

normal spermatogenesis will not occur The fertile range of sperm density varies from 20 million to well over 200 million spermatozoa per ml and it becomes obvious that a marked error in temperature regulation might have little effect on the fertility of a man with a sperm density of 200 million per ml whilst a very minor variation could render a man sterile who had only a potential of 20–30 million per ml

The indications for surgery in oligospermia are quite clear cut (Davidson, 1952, 1954 Hanley 1955 1956) and are strictly confined to the correction of errors of temperature regulation of the testicle the commonest causes of which are varicoceles and small lax hydroceles A varicocele tends to maintain the testicle at body temperature and in an effort to overcome this the scrotum elongates considerably On occasion the scrotum hangs below the testicle and is no longer used as a support in which case the weight of the testicle is borne by the cord and serious discomfort will result Of less common occurrence but of equal importance in temperature control is the testicle retained high in the scrotum by a taut short cord

The semen analyses in cases of abnormal temperature regulation show (*a*) a low sperm density often with a high ejaculate volume combined with a mor phology indicating premature shedding of the sperms or (*b*) a normal density but with impaired morphology and many immature cells but again perhaps associated with a large volume (Davidson 1954)

The indications for surgery designed to correct a failure of temperature regula tion are a typical semen analysis reasonably well developed testicles and definite clinical evidence of a varicocele a hydrocele or a short cord If in addition there has been some improvement in the semen picture following the abandon ment of tight Y front underpants and or a conscientious regime of cold water sponging of the testicles then surgery will nearly always effect some improve ment in the sperm picture Whether the improvement will be sufficient to render the patient fertile d p nds upon the degree of subfertility before operation

In patients with small or doubtful varices it is not possible to decide whether there is a failure of the cooling mechanism without carrying out differential temperature tests with a thermocouple and this should always be done in doubtful cases if unnecessary surgery is to be avoided Improper selection of cases would soon bring the whole principle into disrepute

Operation for varicocele

The operation for varicocele de cribed in the older standard text books of surgery whereby a third or some other fraction of the pampiniform plexus is transfixed ligated and divided will certainly lead on occasion to testicular atrophy This operation has been abandoned There are three alternative approaches to a varicocele

The Palomo operation

The Palomo operation using a short incision parallel to Poupart s ligament 1 inch above the internal ring gives access to the spermatic vessels as they enter the internal ring The spermatic veins can be divided here in complete safety and even if the artery is divided the collateral circulation below this level is perfectly adequate (Palomo 1949)

A blockage of the ampulla or vas itself can only be proved by exploring the vas in its scrotal course and injecting fluid towards the urethra However saline solution has been injected down the vas in over 300 azoospermic patients who have had surgical exploration of the testicle, and in no instance has there been a blockage at the prostatovesicular region in a patient with a normal ejaculate volume (Hanley 1955)

It is considered that this type of retrograde vesiculogram (which is not without morbidity) is unjustified unless there is absence of the ejaculate altogether The only blockages seen in the region of the posterior urethra have been in tuberculosis or following endoscopic resection at the bladder neck

Vesiculography has no place in the treatment of the azoospermic male who has normal ejaculation However, since so little is known about the functions of the prostatic and vesicular secretions vesiculography remains a valuable and as yet incompletely explored, research technique

Azoospermia

In the absence of a history or signs of previous inflammation, complete azoospermia with clinically well developed testes, is usually due to some congenital obstruction or error of sperm conduction If the ejaculate volume is normal this obstruction is unlikely to be in the region of the ejaculatory ducts but rather at the testicular end of the vas (Hanley 1955) The areas of blockage are generally multiple and may be found anywhere from the tail of the epididymis up to the vasa efferentia as they emerge from the body of the testicle (Hanley and Hodges, 1959) There are two important clinical groups namely those with obstruction at the level of the vasa efferentia which will prevent any sperms entering the epididymis and those with obstructions below this level Theoretically this distinction is important because a limited amount of success can be achieved following epididymovasostomy where there are sperms in the epididymal tubules but the author does not know of any authentic success following anastomosis of the vas directly to the body of the testicle

It is becoming increasingly obvious that the azoospermia in a majority of the congenital epididymal anomalies is due to a failure of the conducting mechanism just as much as to an obstructive factor and the prognosis following surgery in such cases is poor This is in contradistinction to the inflammatory obstructions in the tail of the epididymis classically associated with gonorrhoea Provided the vas is patent success can be expected following a short circuit anastomosis in these cases

Traumatic damage to the vas deferens whether performed deliberately for sterilizing purposes or accidentally during a hernia operation can be repaired with success provided the ends can be approximated without tension and this fact should be more widely appreciated (Hanley 1955)

Oligospermia

Testicular temperature regulation

A suspensory bandage or tight Y front underpants are to be heartily condemned in young men still concerned with procreation

Under normal conditions the testicle is maintained at a temperature 2–3°C lower than that of the body generally, and unless this differential is maintained

EPISPADIAS—This is probably the least common congenital anomaly of the external genital tract and in its extreme form may be associated with failure of union of the symphysis pubis and ectopia vesicae The immediate magnitude of this condition generally obscures the long term problem of fertility but it is important that any surgery performed for the relief of incontinence should not interfere with subsequent ejaculation for many of these patients possess normal testes seminal vesicles and ejaculatory ducts and are potentially fertile

If the bladder is excised after urinary diversion it is important to preserve the prostate and the portion of posterior urethra containing the verumontanum and ejaculatory ducts It must also be remembered that if the penis is reconstructed the gutter of urethral mucosa must not be excised but should be preserved to form a urethral canal so that ejaculation can take place It may well be advisable to delay reconstruction of the penis and urethra until well after puberty when there is less likelihood of stricture formation in the new urethra, which would seriously interfere with ejaculation

HYPOSPADIAS—Minor degrees of glandular hypospadias are very common and do not require any surgical correction for fertility purposes provided they are not associated with a chordee

If chordee is present (ventral flexion of the glans *on erection*) it should be corrected before puberty When the glans is freed from its fibrous bands the whole penis will straighten out with the result that the external urinary meatus tends to recede down the shaft making the degree of hypospadias worse and perhaps necessitating some secondary reconstruction of the urethra However a minor degree of hypospadias is a much less important factor in subfertility than a minor unsuspected degree of chordee preventing penetration

UNDESCENDED TESTICLE—The management of delayed testicular descent still produces strong divergence of opinion but there is a growing volume of world literature indicating that a testicle which is maintained at body temperature after the age of about 5 years will not have normal spermatogenesis (Charny and Wolgin 1956 Robinson and Engle 1954)

This conception arising from many different centres is based upon testicular biopsy studies performed at varying ages and cannot any longer be ignored

During the first 4 years of life the testicle remains in a resting phase but from then to the tenth year it enters a *growing phase* which can only occur properly if the correct temperature differential is present There is definite histological evidence that if the testis is retained development of the seminiferous tubules is retarded Although there is as yet no histological proof that these changes are always permanent and cannot be corrected by bringing the testicles down before the age of 10 years there is an increasing volume of opinion in favour of early surgery—that is at about the age of 4–5 years Retention after the age of 10 years will almost certainly result in permanent damage If one accepts this hypothesis it is irrational to wait until just before the onset of puberty before attempting to bring a testicle down into the bottom of the scrotum by surgery

In the absence of any proved and accepted rules the responsibility of the surgeon confronted with the incompletely descended testicle is very great If both testicles are incompletely descended there is no argument An attempt should be made to bring them both down into the scrotum by surgery at the age of 4–5 years It is a much more debatable problem when only one testicle is incompletely descended. The decision here rests largely upon one s philosophy If we do

The inguinal operation

The cord is exposed at the external ring which is opened up if necessary to define the large venous channels

The scrotal operation

A transverse scrotal incision followed by haemostatic closure of the dartos muscle heals remarkably quickly, allowing very early ambulation, and provides adequate exposure for the majority of cases

Although the Palomo operation is completely safe the author has abandoned it because it does not always cure the varicocele It is based upon the assumption that only the spermatic veins become varicose, and this is not necessarily so There may be large channels descending deep into the pelvis with the vas, and below this again at upper scrotal level large clusters travelling from the cord through the superficial fat towards the dorsum of the penis These latter two channels are not accessible via the Palomo incision

In theory it is safer to explore the cord in the inguinal canal where the arteries are still large enough to be seen clearly and where the veins are joining up into large channels It is also possible to ligate all of the accessory veins running in the fat towards the dorsum of the penis and mons The scrotal approach has the great advantage of very rapid ambulation without the necessity of removing sutures or clips, and can in a majority of cases provide access as high as the external ring Whichever of these two incisions is used the actual pampiniform plexus inside its glistening sheath should always be opened with the greatest care—if at all In fact, when we explore the classical bag of worms , the dilated veins will be quite discrete and many of them will be outside or at most, lying just within the capsule of the cord and can be divided and tied quite separately without opening the cord proper In cases where there are no large discrete veins but where the cord is infiltrated with a fatty matrix containing myriads of small veins it is much safer to ligate the channels higher up in the canal

The whole operation is simplified if the patient is tilted feet down when the veins will fill and be clearly visible

It must not be assumed that varicoceles occur only on the left side while lax hydrocele should be carefully sought for on both sides, especially on the right

Operation for hydrocele

A lax hydrocele containing 5–6 ml of fluid is difficult to detect by transillumination, but can seriously interfere with scrotal temperature regulation Small hydroceles should be everted if necessary on both sides

The prophylactic surgery of infertility

As has already been made clear, a most important part of the surgical management of infertility is prophylactic It is therefore essential that the family doctor should be alive to the danger that certain conditions may lead to incurable infertility unless adequately treated and in good time

Congenital lesions

Many subfertile males have defects of the genital system which are present or develop during childhood, and an encouraging number of these are amenable to surgery

so-called non specific epididymo-orchitis may well fall into this category From the treatment point of view incision or multiple punctures of the tunica albuginia as *originally recommended* by Walker (1948) should be seriously considered since the immediate clinical relief can be dramatic and at least no harm is done If the condition is bilateral there should be no hesitation whatever Immediate surgical intervention may prevent complete sterility

TORSION OF THE TESTICLE —Atrophy of the testicle due to torsion is probably a much more common occurrence than is generally admitted It is not always sudden and dramatic and may not always be so painful as one would anticipate Even a partial torsion or recurrent mild attacks may well lead to destruction of the testicle and there is little doubt that many of the atrophic testicles which one sees and which are supposed to have followed an attack of epididymo orchitis were in fact torsions which were not diagnosed as such

It should be remembered that rotation cannot occur in an anatomically normal testis owing to the fact that the organ is fixed posteriorly along the reflexion of the tunica vaginalis where there is no serous covering and therefore no pedicle In the incompletely descended organ the normal inversion may not progress with the result that the testis tends to hang upside down suspended by the tail of the epididymis and completely surrounded by *serous membrane* Torsion can thus easily occur where the tail of the epididymis enters this serous sac The condition may occur at any age but is commonest at about 5 years and again between 15 and 25 years being rare after the age of 50 years *In childhood* torsion has to be differentiated from a non specific epididymitis though in the writer s experience this is very rare in children *In adolescents* and young men mumps *orchitis and* acute epididymitis may be simulated by torsion but in general the history of sudden pain and shock accompanied by a very tender scrotal swelling is quite characteristic *of torsion* Gentle *twisting of* the mass in one direction will produce exquisite pain while twisting in the opposite direction may effect a cure

The less *severe cases* are much more difficult to diagnose especially if seen several hours or even days after the onset The pain may have abated and the picture is now complicated by the development of a hydrocele containing blood stained fluid Manual correction of the torsion at this stage will be impossible and immediate surgery should be carried out No case of torsion will subside unless it is fully reduced If there is any doubt whatever about the diagnosis the testicle must be explored Even if the swelling is due to mumps or epididymitis surgery will have done no harm but if a torsion is missed the testicle will be destroyed

Not infrequently there is the history of repeated attacks of testicular *pain* and swelling which subside *completely* after a short space of time These may be recurrent attacks of *torsion* and if on careful palpation during a quiescent period the *testicle is* found to lie horizontally or *even* upside down it should be exposed and fixed In the same way a typical torsion which i reduced manually should be *subsequently* explored and fixed since recurrence is more than likely It is important to remember that *the congenital* anomaly which makes torsion possible may well be bilateral and the opposite tunica *vaginalis should* therefore always be opened if perfectly normal inversion is not present The resulting adhe ions to the scar will effectively fix the testicle thus preventing subsequent torsion on this side

H G H

nothing the testicle may descend on its own just before puberty and may appear to be perfectly normal but we shall never know whether it has normal spermatogenesis since nature has adorned us with two gonads

In the writer's opinion all of these testicles should be explored at about the age of 4-5 years and he agrees with Hinman (1955) that surgery at this age if performed with due care is no more dangerous than it is at puberty This is strengthened by our findings that some 60 per cent of patients having unilateral small testicles with oligospermia at the subfertility clinic have " retractile testicles or could remember a time when one or both gonads were not down in the scrotum

It is important to differentiate between the migratory or " retractile testicle which can be brought down into the scrotum manually and the truly undescended organ which has never been in the scrotum because as Scorer (1955) has shown when a testicle cannot be brought down into the bottom of the scrotum at birth or by the end of the first year at the latest it will probably never descend properly on its own

When bilateral retained testes are encountered in adult life, the fertility prognosis in most cases is hopeless The writer has not encountered a patient with bilateral truly undescended testicles who has ever produced viable sperms in the ejaculate Neither does he know of a bilateral orchiopexy performed on truly undescended testicles at puberty which has resulted in viable sperms in the ejaculate The retractile ' testicle often with a short cord which holds it high in the scrotum has a much better prognosis Even occasional subjection to the lower scrotal temperature may have permitted quite a useful degree of spermatogenesis, and if such testes can be brought down into the bottom of the scrotum there is every hope that some improvement at least will result

However a testicle should not be left in a vulnerable position over the pubic ramus and if it will obviously not stay down after surgery it should be removed since it will have no spermatogenic future It may of course excrete hormones and should be preserved if the condition is bilateral

Operative technique The choice between the various types of orchiopexy is also a very controversial issue and it must be stressed immediately that bringing the testicle down at all costs and holding it there by every means possible will produce only a cosmetic effect If there is tension on the blood supply the testicle will atrophy

The most important part of any orchiopexy is the adequate dissection of the cord and its fibromuscular bands The testicle must lie where we wish it to remain without undue artificial traction For this reason the Keetley Thorek operation is losing favour among urologists and most authorities are now content to anchor the testicle at its lowest point by a long thigh stitch for a day or so only to prevent it retracting on the way back to the ward before adhesions have developed Mimpriss (1952) originally pointed out that a secondary operation some years later would often enable the testicle to be brought down still further and this fact has not received sufficient attention

Acquired lesions

MUMPS ORCHITIS —Mumps orchitis occurring after puberty is a very serious occurrence, and will in the majority of cases lead to atrophy of the testicle An orchitis followed by atrophy and clinically similar to mumps may develop without any parotid swelling (Connolly, 1953) and one suspects that atrophy following a

Fallopian tubes

Post inflammatory occlusion is by far the commonest cause of infertility and is usually claimed to account for about 20 per cent of the total number of cases However Stallworthy (1958) believes that only 10–15 per cent are really occluded the remainder being rendered apparently so by spasm True occlusion may be due to post abortional sepsis tuberculosis or extragenital infection such as pelvic abscess following acute appendicitis

Investigations

After clinical examination of the pelvic organs certain special tests may be used to prove tubal patency These are tubal insufflation and hysterosalpingography

Tubal insufflation

The Rubins insufflation with CO_2 may be used or preferably because it is much safer the kymographic method The Sharman Bonnet or Barton kymograph methods are both very satisfactory Insufflation can be done in an outpatient clinic without an anaesthetic A certain number of the patients insufflated show apparently occluded tubes which when re investigated later are found to be patent This apparent occlusion is due to spasm

The contraindications to tubal insufflation are important They are as follows

(1) During menstruation there may be a risk of retrograde implantation of endometrium leading to endometriosis

(2) In presence of infection including vaginal as well as cervical uterine and tubal infections

(3) If systemic disease is present making pregnancy undesirable for example severe cardiovascular disease nephritis diabetes and so on

Tubal insufflation is usually perfectly safe provided the patients are carefully selected The pressure used should never exceed 200 mm Hg lest the tube should rupture Risks from insufflation are the possibility of flaring a previous infection or very remotely sudden death from air embolism

Hysterosalpingography

The merit of hysterosalpingography using a contrast medium such as Endografin (Viscous) is that a visual record of the tubes and uterus is obtained The indications are as follows

(1) In cases where insufflation has failed to prove tubal patency The radio graph will show regularity or irregularity in the outline of the tube or diverticula may be present as in tuberculosis The radiograph will also show unilateral or bilateral occlusion and the exact site of the blockage Cornual occlusion shows no contrast medium in the tube fimbrial blockage shows distension or even balloon ing at the fimbrial end a finding suggesting hydrosalpinx

(2) In cases where it is desirable to outline the uterine cavity for instance in congenital malformation including septa when there are filling defects caused by polypi or small fibroids and lastly to demonstrate competence of the cervix

Hysterosalpingography may have a curative effect by breaking down filmy tubal adhesions The risks are the same as for insufflation

INFERTILITY IN THE FEMALE

A searching history is first obtained, not only of marital relationships and menstrual function, but also of any previous illness or operation which might have involved the genital tract The most important of these is pelvic infection either by pyogenic organisms or tuberculosis, a common source being a pelvic abscess following acute appendicitis To prove that spermatozoa are deposited in the vagina it is advisable to make a post coital examination A specimen of the mucus from the cervical canal is studied within 10 hours of coitus to determine whether the spermatozoa have penetrated this mucoid plug

To establish that ovulation is taking place is straightforward, though time consuming It is necessary to record the rectal temperature on a chart daily throughout several menstrual cycles It is noticed that under the influence of oestrogenic hormone secretion the temperature tends to fall At ovulation and during the secretory (progesterone) phase the temperature rises 1°F, falling again just before the onset of the next period The actual time of ovulation can thus be pinpointed Endometrial biopsy done in the latter half of the menstrual cycle will also give positive evidence of ovulation by showing the secretory type of endometrium Endometrial biopsy is also useful for diagnostic purposes, particularly to exclude genital tuberculosis

Aetiology

The causes of infertility may be found under the following headings

Vulva and vagina

The principal factor here is a thick fleshy inelastic hymen causing pain on any attempt at coitus or vaginismus due to the fear of pain

Cervix uteri

Here may be found the pinhole os seen in genital hypoplasia excessive mucoid discharges infections tears or polyps at the external os

Uterus

RETROVERSION —The congenital retroversion seen in about 16 per cent of women is not a bar to conception It is only when the retroversion is fixed, as would be seen following inflammatory disease or when associated with endometriosis, that the retroversion would be considered to point to the cause of infertility

MALDEVELOPMENT OR MALFORMATION —Double septate or subseptate conditions or gross underdevelopment

NEW GROWTHS POLYPI OR FIBROMYOMAS —Fibroids may have little or no bearing on infertility unless the uterine cavity is distorted or the cornua obliterated

Ovaries

CYSTS AND SOLID TUMOURS —These are not usually responsible for infertility, for they tend to occur only in older women and are seldom bilateral A dermoid cyst occurs in the young, however and many are diagnosed in the antenatal clinic They are, therefore evidently no bar to conception

ENDOMETRIOSIS —There is a common association between endometriosis and infertility Indeed, it is quite unusual for pregnancy to occur in cases of endometriosis

in doubt Endometriosis is the commonest ovarian tumour causing infertility In these cases only abnormal tissue should be removed It is quite usual to find normal ovarian tissue at the pedicle It must be remembered that women can and have become pregnant even though only a fragment of normal ovarian tissue was left after the removal of an endometrioma even though both ovaries were involved

Fallopian tubes

OCCLUDED FALLOPIAN TUBES —Surgical operation to relieve this condition may be either removal of peritubal adhesions reconstruction of the fimbrial end of the tube (salpingostomy) or tubal implantation when the occlusion is cornual Before advising any surgical treatment it is necessary to be certain that the patient has a normal uterus that she ovulates is of suitable age for child bearing (under 40 years) and that both tubes are blocked. Her husband should also be fertile It is also important to ensure that there is no active pelvic infection at the time of the proposed operation

SURGICAL TECHNIQUES —Division of adhesions salpingostomy and tubal implantation

(1) *Division of adhesions* These are mainly round the fimbrial ends and can be seen after hysterosalpingography by abnormal position of the tube or loculation of the contrast medium round the orifice

Division of the adhesions should be very carefully done by scissors dissection and haemostasis should be complete before the abdomen is closed

(2) *Salpingostomy* This is done when tubal occlusion is present at the fimbrial end The choice lies between the cuff method or alternatively by incising the antimesenteric border of the tube from the fimbrial end for about ¾ inch. The edges of the mucosa are then sewn back to evert the edges This method is more likely to be successful than the " cuff method An eyeless needle should always be used with 6 × 0 catgut or very fine thread or nylon Care with haemostasis is again paramount

(3) *Tubal implantation* This operation is advised in cases of occlusion of the tubes at the cornus which is the commonest type of occlusion following an abortion either spontaneous or induced Of the induced abortions this type of occlusion usually follows intrauterine douching or the use of Utus paste Before tubal implantation is done it is always advisable to test for tubal patency from above A fine nasal catheter is passed down the tube from the fimbrial end and insufflated using a 20 ml syringe It is noticed that distension occurs just proximal to the site of the block Sometimes the air may pass through so re establishing patency on one or both sides There are various methods used to implant the tubes In each m thod the tubes are divided proximal to the obstruction and polythene rods or tubing passed through the tubes Polythene rods are the better as there is no risk of infection passing up the lumen The uterus is then opened, either by a wedge shaped incision at each corner—Green Armytage (1955) uses a reamer for the purpose—or alternatively a transverse incision is made across the fundus from cornu to cornu The Fallopian tube containing the polythene rod is laid into the gutter made at each cornu and carefully stitched in position If the uterus has to be opened transversely Stallworthy (1958) advises that the uterine free ends of the polythene rods be sutured together to make removal easier If the tubes are implanted by the wedge or reamer method there should be a sufficient

Surgical treatment

Hymen

Dilatation by the finger or by glass dilators can be used for the soft undilated or partially ruptured hymen However, if the hymen is complete thick, and inelastic a hymenectomy should be done

Cervix uteri

In cases of congenital pinhole os dilatation of the cervix is usually necessary Care must be taken not to tear the internal os for this might lead to cervical incompetence Cervical tears sustained in a previous pregnancy may also cause incompetence The incompetent internal os is likely to cause subsequent abortions during the middle trimester Shirodkar (1955) treated this condition by burying a nylon or fascial strip purse string suture just below the internal os inserted through a small incision in the anterior fornix This suture is removed about the thirty eighth week of pregnancy or during labour Johnstone (1958) used a tantalum wire loop to encircle the cervix For other types of cervical tears trachelorrhaphy operations are required Cervical erosions should be treated by diathermy cauterization but this should not be too deep otherwise secondary haemorrhage or stenosis may follow It should never be done during menstruation because of the risk of endometrial implantation leading to endometriosis

Uterus

THE DOUBLE OR SEPTATE UTERUS —Plastic operations have been devised to unite the two horns or to remove the intervening septum The underlying principle is to convert two complete cavities into a single one This type of operation can only be done if the two horns of the double uterus or both sides of the septate uterus are comparable in size If there is disparity between the two sides in the double uterus the smaller horn should be removed Tubal patency should have been proved by hysterosalpingography before any plastic operation of this kind is undertaken

RETROVERSION —Most cases of infertility associated with retroversion of the uterus will have followed pelvic infection The Hodge pessary support is not suitable as the uterus is firmly stuck down and cannot be pushed up The effective surgical treatment is either to suspend the uterus forward or preferably to shorten *the round ligaments by plication*

FIBROIDS —The essential points of the myomectomy operation are to remove the fibroid through an anterior incision if at all possible to take care not to *damage the Fallopian tubes at the cornua* and to take *great care in* the closure of the uterine wall and peritoneum An incision in the posterior wall is often followed by fixation in retroversion After any myomectomy it is usually desirable to suspend the uterus or ensure anteversion by plication of the round ligaments

Pelvic infection

An exacerbation of a previous even though latent infection may follow insufflation or hysterosalpingography, however carefully chosen or done If the tubes had been formerly patent a course of short wave diathermy should be advised

Ovary

OVARIAN TUMOURS —It is usual practice to remove any cyst or solid tumour of the ovary when diagnosed as the pathology of an ovarian new growth is often

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length of polythene rod projecting into the uterine cavity to enable easy removal later The polythene rod should not be passed through the cervical canal

It must be appreciated that tubal implantation is the most delicate of all gynaecological operations that the patent tube must not be damaged during operation, that the fixation stitches securing the tube to the uterine well must not be too tight, thereby preventing stenosis, and finally absolute haemostasis must be secured

The after care in these cases is important Many advise antibiotics and sulphonamide treatment in the immediate post operative period and this is probably wise Green Armytage (1955) recommended that the polythene rods be left *in situ* for 6 weeks, others remove them in 2–3 weeks The rods are easy to remove by small sponge holding forceps after dilatation of the cervix Almost all insufflate the tubes within 2 weeks after removal of the polythene rods Hysterosalpingography may be done either as an alternative or in addition to insufflation

Pregnancies following implantation of the tubes are now seen in increasing numbers, especially in young and healthy women This success is partly accounted for by the increased appreciation of the meticulous care required during the operation and partly by the use of the polythene rod to maintain patency during the healing period

ARTIFICIAL INSEMINATION

When no abnormality is found in the female partner and the male after treatment, is still oligospermic, or for some reason such as premature or retrograde ejaculation is unable to deposit semen normally in the vagina artificial insemination using seminal fluid obtained from the husband (A I H) may be considered Insemination is done about the time of proven ovulation using 1 ml of seminal fluid If necessary it is repeated two or three times at subsequent cycles

Artificial insemination by donor (A I D) will only be undertaken in such cases as complete male sterility and after the most careful consideration The grave legal and ethical considerations will not be discussed here they are at present the subject of a Royal Commission

J M

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of the brain and other such collector s items are seldom found, apart from the sexual precocity the child is usually completely normal although there may be some shortness of stature because the early oestrogenic action causes premature closure of the epiphyses Careful general examination and a pelvic examination under anaesthesia are wisely done to exclude rare diseases but in practice further treatment is seldom required

A more common disorder is excessive menstrual bleeding at puberty owing to irregular production of oestrogens without ovulation Such irregularities are usually of limited duration and then all that is required is the administration of iron and reassurance often of the mother rather than the patient For more prolonged bleeding injections of progesterone or the oral administration of one of the newer synthetic progestogens may be needed but curettage is not required

ABNORMAL BLEEDING DURING THE REPRODUCTIVE PHASE

During the years of reproductive activity patients with abnormal bleeding may be conveniently divided into those with cyclical loss whether excessive (menorrhagia) or with shortened and over frequent cycles (epimenorrhoea) and those with irregular bleeding (metrorrhagia) In cyclical bleeding the blood obviously comes from the endometrium in irregular bleeding the blood may come from the endometrium but may also come from the cervix or elsewhere

Abnormal bleeding due to complications of pregnancy

Although they will not be discussed at length here such complications as incomplete abortion and ectopic pregnancy must not be forgotten as causes of irregular bleeding during the reproductive years An ectopic pregnancy especially a tubal mole sometimes goes undiagnosed for a time because the possibility is not considered and if there is pain with bleeding and a tender swelling beside the ut rus even if no period has been missed examination under anaesthesia is required usually as a prelude to laparotomy

Abnormal bleeding with abnormal pelvic physical signs

The other causes of bleeding during the reproductive years may be described conveniently under the headings of those patients with evident abnormal pelvic physical signs and those without such signs Fibroids endometriosis salpingo oophoritis and cervical causes of bl eding such as erosions or polyps are usually discovered on ordinary examination Here the difficulty is not in diagnosis but in the choice of treatment and many factors require consideration The age and parity of the patient are obviously important the woman with a large family and menorrhagia asks only for a quick and certain cure and will usually w lcome a hysterectomy whereas the young unmarried woman will try almost anything to avoid the loss of her uterus Racial and religious considerations may arise and there is a considerable folk lore even among doctors about the adverse results of hysterectomy

Fibroids

When fibroids are causing menorrhagia conservative treatment is seldom successful Even if the menopause appears imminent it is often delayed in these cases so that a waiting policy is usually unwise when bleeding is heavy If proper do es of iron are given and the haemoglobin level is not maintained then surgery must be advised Myomectomy has a limited place and although it is certainly to be

CHAPTER 15

ABNORMAL UTERINE BLEEDING

STANLEY G CLAYTON

It is not possible to discuss the whole significance and management of abnormal bleeding in a single chapter of ordinary length for abnormal bleeding occurs in so many disorders of the pelvic organs and endocrine system that nearly every aspect of gynaecology would have to be included and some selection of the subjects to be mentioned is therefore inevitable The management of complications of pregnancy and details of endocrine treatment have been excluded and the purpose of this chapter is to suggest the proper occasions for recommending surgical investigation or treatment, and also to discuss some of the after effects of gynaecological operations

Abnormal uterine bleeding may be serious in itself as a cause of severe anaemia but it may also be important as a warning of some serious disease such as cancer, or it may draw attention to an emotional or endocrine disturbance The difficulty for the general physician is to distinguish the trivial and often transitory functional menstrual disorder from the cases of more serious significance and he is often uncertain when it is necessary to send the patient for fuller investigation The specialist s diagnosis depends largely on examination under anaesthesia and biopsy of the endometrium or cervix Of course examination under anaesthesia is sometimes justified merely to effect a proper physical examination in the case of an apprehensive or difficult patient but there is some risk of curettage being recommended as a sort of gynaecological placebo It cannot be stated too strongly that curettage is usually a diagnostic measure analogous to cystoscopy It is true that a few vesical disorders can be treated through the cystoscope but the instrument is essentially a diagnostic aid and cystoscopy would hardly be recommended as a treatment The curette should be thought of in the same way Although retained chorionic fragments or an endometrial polyp may be removed with the curette it will not cure a hormonal abnormality of the endometrium and if the underlying abnormality persists the bleeding will certainly recur in subsequent cycles Simple curettage sometimes appears to effect a cure but only when spontaneous remission of the bleeding would have occurred in any case The difficulty is to decide when it is necessary to recommend curettage for diagnosis and particular attention is given to this point in the following discussion It is practical and customary to subdivide abnormal bleeding according to the age at which it occurs and we may first consider bleeding in children

ABNORMAL BLEEDING IN CHILDREN

A blood stained discharge in a young child is very seldom due to such dramatic disorders as an oestrogenic tumour or a uterine sarcoma and the far more likely cause a foreign body in the vagina is often overlooked In cases of precocious puberty themselves rare, tumours in the region of the floor of the third ventricle

in any case surgery should be preceded by chemotherapy The discovery of tuberculosis by endometrial biopsy in the course of investigation of infertility does not concern us here as few of these patients have any menstrual upset Tuberculosis with menorrhagia is usually more advanced with adnexal masses, and the clue to the diagnosis lies in the history Not only is there a lack of any history suggesting an ascending puerperal or gonococcal infection but there is often a clear history of tuberculosis of lung kidney peritoneum bone or lymph nodes and sometimes an active lesion is discovered at one of these sites Endometrial fragments obtained by curettage or from menstrual lochia may show histological evidence of tuberculosis or cause infection when they are inoculated into a guinea pig If tuberculosis is recognized to be the cause in chronic salpingo-oophoritis then attention to the general health and a full course (1 year rather than 3 months) of antituberculous drugs is advised Only if the menorrhagia or pain fails to improve would surgical treatment be considered and then only if there was no active pulmonary or renal disease, and if the local physical signs suggested that the operation would be reasonably safe To operate in the presence of dense adhesions and plastic peritonitis can be extremely difficult and there is a real risk of injury to the bowel and fistula formation

For chronic salpingo oophoritis with menorrhagia not due to tuberculosis surgery is usually required though it is often difficult because of dense adhesions and loss of the ordinary anatomical landmarks If the tubes are grossly damaged then recovery of reproductive function is impossible and radical treatment is usually kind st In addition to bilateral salpingectomy hysterectomy is required to deal with the menorrhagia and often because the cervix is also infected Even in young women if the ovaries are much involved it is wisest to remove them rather than to leave infected tissue although in less severe cases an attempt is often made to conserve some ovarian tissue Oestrogens can be given subsequently if necessary

Abnormal bleeding without abnormal pelvic physical signs (dysfunctional bleeding)

In the other and larger group of patients with bleeding during the reproductive years no abnormal physical signs are discovered and it is for this group that surgical treatment has a less certain place It is always important to make a general survey of the patient Although most of the gross endocrine disorders such as thyrotoxicosis myxoedema or pituitary gland disease will ultimately cause amenorrhoea there may be a transient phase of menorrhagia Blood disorders very seldom cause menorrhagia but conversely a constant watch must be kept for the development of hypochromic anaemia Vague ill health in women is often due to a moderate degree of iron deficiency anaemia which is accentuated by menstrual losses and the administration of iron in effective form and doses is all that is needed Indeed even if the menstrual loss is heavier than normal h alth can often be maintained and surgery avoided by giving extra iron

Emotional disturbances are discovered in a large number of these patients if careful histories are taken not only of sexual or reproductive difficulties but of anxieties fears and frustrations of all kinds and menorrhagia can sometimes be cured by dealing with such problems Although this is obvious enough to any experienced and sympathetic doctor who has the time to know his patients well, unfortunately it is often difficult to remove the underlying anxiety or emotional difficulty for it may be based on unavoidable social relationships

tried in young nulliparous women, hysterectomy is the better plan for women who already have the family they want, or for women in the late forties After myomectomy for menorrhagia there is a considerable risk of recurrence of the trouble sooner or later It is difficult to give useful figures to express this risk, as the site and number of abroids present and the age of the patient so much affect the outcome It is technically possible to remove scores of fibroids from a uterus but the surgeon must keep some sense of proportion To leave a grossly disorganized organ with seedling fibroids that will grow is no service to the patient and extended myomectomy carries a greater immediate risk than hysterectomy It is futile to conserve the uterus unless it is likely to be used for and to be effective in child bearing Menstrual bleeding is a nuisance not a sexual badge that must be preserved at all costs, though the deep prejudices of some women in this matter must be respected, and no operation of this type should be undertaken without the real understanding and consent of the patient

Endometriosis

More difficult problems arise in endometriosis, which occurs in women who are often young and nulliparous The indication for surgical treatment here is usually pain rather than bleeding, for the latter is seldom severe enough to cause anaemia The disease frequently involves both ovaries but even when there are many pelvic adhesions it is surprising how often a painstaking surgeon can enucleate chocolate cysts or at least only excise part of the ovary, leaving enough normal tissue for endocrine function Although the tubes are nearly always patent fertility is unlikely to be achieved The reason for this is not always clear, it may be due to the widespread pelvic adhesions and sometimes to anovular ovarian cycles

The most difficult problems in endometriosis arise when the rectovaginal septum is involved Small isolated islets on the peritoneum of the rectovaginal pouch may be coagulated with the diathermy needle but with extensive infiltration of the rectovaginal septum it is usually safest and wisest to remove both ovaries and to perform a subtotal hysterectomy, rather than to attempt a formidable excision of a mass which involves the rectal wall below the level of the peritoneal reflection In such advanced cases the surgeon may console the patient and himself with the fact that normal reproductive function is unlikely to be recovered in any case and that with any less radical attack on the patient s ovaries her pain and bleeding are likely to continue

Chronic salpingo oophoritis

In chronic salpingo oophoritis very severe menorrhagia can occur, the author has seen a patient with a haemoglobin concentration of 25 per cent from this cause The diagnosis is not always obvious Endometriosis and salpingitis give similar clinical pictures with pain menorrhagia and infertility and in both the uterus is tied down in retroversion by bilateral tubo ovarian swellings although there is the difference that most patients with salpingitis will give a history of infection following abortion or delivery of purulent cervical discharge or of treatment for gonorrhoea In most instances the distinction between endometriosis and salpingitis may not matter much as the ultimate treatment is likely to be surgical but the recognition of salpingitis due to tuberculosis is very important as this is often best treated by conservative rather than surgical methods and

Treatment by the induction of the menopause

For abnormal bleeding due to benign causes induction of the menopause may be an alternative to hysterectomy In recent years the method has been in disfavour but it may well return It is not a suitable treatment for patients who have large tumours or any pelvic infection Menopausal symptoms such as hot flushes may certainly follow it but it is doubtful if these are any more severe than those which occur in some instances of the natural menopause The objection that it is sometimes followed by a carcinoma of the uterus that would have been prevented by hysterectomy is often brought forward but this argument is fallacious The risk of death at hysterectomy slight as it is far exceeds the risk of developing a cancer of the uterus and dying from it after the induction of an artificial menopause The advantage that the patient is only in hospital for a short time after induction of the menopause is very real and the method should have an occasional place for benign bleeding in women who are near to the menopausal age

ABNORMAL BLEEDING AT OR AFTER THE MENOPAUSE

The group of patients with abnormal bleeding during the years of reproductive activity is probably the largest seen by the general practitioner but the specialist sees more of the third group—that of patients with bleeding at or after the menopause To these the attitude of mind of the doctor should be entirely different he should be constantly suspicious of the possibility of malignant disease and immediate full investigation is required It is true that even in this group only about one third will show some serious lesion but that proportion is large enough to justify this attitude

Investigation and management

Schiller s iodine test is seldom used now but may still be a useful guide to the best area from which to take a biopsy specimen of the cervix selecting from the unstained areas Colposcopy requires the use of special equipment and the observer requires special experience of it if he is to make accurate interpretations The examination of cervical and vaginal smears is a simple procedure for the patient and certainly may reveal carcinoma *in situ* or early invasive cancer before the clinician can detect any abnormality Probably the best method of examining the cervix is to scrape the surface g ntly with a wooden spatula after it has been exposed with a speculum The spatula is then rubbed over the surface of a micro scope slide A complementary method is to aspirate a little secretion from the posterior fornix with a glass pipette to which a strong rubber suction bulb has been attached The secretion is then expressed on to the slide Cells from cervical cancer are freely desquamated and are likely to be found in the smear but cells from the cavity of the uterus although they are shed are less easily found in the vagina and cells from the tubes or ovaries are still less easily discovered Two practical details are important First the material must not be allowed to dry out on the slide which must be placed in the appropriate fixative at once Secondly the smear should be thin and well spread The examination of the slides is laborious and time-consuming and the observer requires some experience of the method These are disadvantages of the method if it is to be used for screening large numbers of patients although this is in fact the chief applica tion of the techniqu. In the patients under discussion in whom bleeding has already been noticed ordinary clinical examination and biopsy are as likely to

Cyclical bleeding

These cases of so called dysfunctional bleeding may be subdivided further into those with cyclical bleeding and those with irregular bleeding If the bleeding is cyclical and there are no abnormal physical signs on pelvic examination, and no obvious general disease or emotional problem the doctor should temporize as long as possible, as so many of these episodes of menorrhagia or epimenorrhoea are limited in duration and cease spontaneously If the bleeding is so severe that the haemoglobin level cannot be maintained by giving iron or sometimes when infertility is part of the problem curettage should be undertaken as an investigation rather than as a treatment It is true that abnormal bleeding sometimes stops after simple curettage perhaps by supplying the patient with the reassurance of a treatment in which she believes and sometimes because the bleeding was about to stop in any case It is not stated often enough and clearly enough that in more than 50 per cent of the cases of this nature no endometrial abnormality is discovered on curettage and it is then illogical to expect any benefit from this operation This is not to say that there may not be some subtle alteration in the endometrium perhaps in the basal arterioles but if we cannot find anything abnormal on histological examination we have no guide to further treatment

Sometimes the premenstrual endometrium (and only in that phase is the observation significant) is found to be non secretory or hyperplastic and treatment with a progestogen may be tried but in other cases hormone treatment is entirely empirical and indeed the results are poor enough to support the suspicion that it has little rational basis We cannot regulate the output of hormones, we can meet the needs of a gross deficiency, but cannot reduce an excess or nicely regulate the balance between the different hormones Total inhibition of bleeding with large doses of oestrogens or with testosterone is possible and sometimes useful in arresting profuse loss but such treatment cannot be more than temporary Fortunately it is only in a small number of cases of this sort in patients of this age that bleeding continues to such a degree that radical treatment becomes inevitable but hysterectomy is sometimes justifiable and beneficial even when the uterus shows little structural abnormality and it is known that the real trouble lies in the patient s environment

Irregular bleeding

The other group of patients with dysfunctional bleeding consists of those with irregular bleeding For these curettage should be recommended at an earlier stage Not only may some lesion of the cervix or adnexa have been missed but with irregular bleeding there is a greater probability of discovering something significant in the uterus such as retained chorionic tissue an endometrial polyp metropathia haemorrhagica or even in the later years of the reproductive phase an endometrial carcinoma A few of the patients with metropathia may respond to hormone treatment with progestogens, but in women over the age of 40 years the response seems to be uncertain and radical treatment is more often indicated

A separate group of patients with irregular bleeding or short frequent cycles consists of patients who have these difficulties shortly after miscarriage or delivery There are often additional factors of fatigue anaemia anxiety about the baby or loss of it or pelvic infection, but in general these patients recover spontaneously Only if the loss is severe or persistent or if the obstetric history suggests that chorionic tissue may be retained should curettage be recommended

Another topic that may be discussed briefly and in general terms is the management of advanced cervical cancer In a few instances it is technically feasible to remove the uterus with the involved rectum (*posterior exenteration*) and to perform a colostomy In others it is not difficult to remove the bladder with the uterus and to transplant the ureters into the colon (anterior exenteration) Both these are reasonable surgical ventures with some hope of prolonging life or even of cure without an impossibly high price in suffering to be paid by the patient Yet many humane surgeons hesitate to recommend the extreme of total exenteration with its sequel of both colostomy and urinary drainage even though modern techniques with the Rutzen type of colostomy bag may make the control of discharges more effective So many patients subjected to this type of operation spend many painful weeks in hospital afterwards only to survive for a short time after discharge The intrathecal injection of alcohol or chordotomy are measures which are occasionally employed successfully to relieve pain in advanced cases

SEQUELAE OF HYSTERECTOMY

In conclusion a few remarks may be made about the sequelae of hysterectomy particularly those that may need to be discussed with patients before operation The immediate risks and accidents of the operation are no different in principle from those of other surgical operations and their effects are usually overcome before the patient leaves the care of the surgeon The troubles that occur in the weeks after the patient s return home are more often of psychosomatic origin and vary greatly in degree A woman who is utterly tired of the nuisance and ill health due to persistent menorrhagia especially if she has had children will gladly agree to hysterectomy and will be grateful for it whereas a younger nullipara may only accept the advice that her uterus should be removed with misgiving and regret Many a patient believes or has at least been told by someone that removal of her womb will turn her into an old woman It is difficult to disentangle the various notions that are included in this affirmation There will always be a few hypochondriacs who make themselves into perpetual invalids after any surgical procedure but there is no evidence that this occurs more often after hysterectomy than after other comparable operations

A few women will alter their mode of life greatly after hysterectomy, and gain a great deal of weight This is due not to any hormonal change for it may occur even when the ovaries are not removed but to lessened activity and altered diet A subsidiary advantage of the modern regime of getting out of bed soon after surgical operations is that patients are not allowed to suffer a long phase of restriction of activity which may be the starting point for a radical change in their habits Firm advice on diet with regular weighing is sometimes needed

Before a hysterectomy is undertaken it is important to make sure that the patient and her husband understand the nature of the intended procedure In particular the probable fate of the ovaries should be discussed Unless explanations are given the ordinary patient seldom realizes that it is the ovaries that make her feminine and regulate the change rather than the womb The ovaries must always be removed in malignant disease sometimes in endometriosis and sometimes if they are disorganized by infection Most surgeons remove them routinely when performing hysterectomy in post menopausal patients or those who are verging on the menopause In other cases and particularly in young women they should not be removed nor should their blood supply be impeded

discover the lesion and in any case a positive smear report cannot be accepted as a substitute for proper biopsy, which must still be performed before radical treatment

A step in operative investigation that should be undertaken more often is cystoscopy In any case of post menopausal bleeding especially one in which the source of the bleeding is uncertain, cystoscopy should be performed when uterine examination fails to reveal a cause By this means a few vesical new growths have been discovered at an early stage

Certain other pitfalls of diagnosis arise A new and common cause of post menopausal bleeding is treatment with stilboestrol or other oestrogens There are few good gynaecological reasons for giving stilboestrol to post menopausal women, and in these cases the drug should only be given for a short time yet it is relatively common to encounter patients (in addition to those with breast car cinoma) who have been taking stilboestrol for years sometimes even on the advice of a doctor Stilboestrol is not a ' tonic ' and the bleeding that it causes brings diagnostic problems If slight bleeding has only occurred on a single occasion 7–10 days after withdrawal of the drug it is probably justifiable to do no more than watch the patient but if there is repeated or continued bleeding curettage must be done to exclude another more sinister diagnosis

The doctor should also be on his guard against missing a double diagnosis in the post menopausal patient and in particular the discovery of fibroids at this age *may mean very little Fibroids do not cause bleeding after the* menopause unless they are polypoid and a coincidental cancer of the body of the uterus is a more likely diagnosis if there is bleeding Again, such lesions as urethral caruncles or cervical polyps will not explain heavy bleeding and if there is any doubt proper curettage should be performed

It is not intended to discuss fully here the best treatment for cancer of the uterus, the text books and journals are full of the contending arguments of surgeons and radiotherapists, but at the risk of seeming controversial one point may be made It is wrong in the author s view to refer cases of possible gynaeco logical cancer directly for radiotherapy The radiotherapist undertakes the treat ment of cancer in many sites and he would surely be a bold and unwise man if he claimed specialist diagnostic skill in all of these The initial problem of diagnosis may involve wider issues than that of cancer alone There need be no real fear that gynaecologists will not refer patients for radiotherapy if that is really shown to be the best treatment but of course the ideal plan is for the radiotherapist and the gynaecologist to see the patient together

The majority of gynaecologists recommend radiotherapy for cervical cancer although a minority (to which the author belongs) prefer operative treatment for the early case and claim to show equal results Combined methods of treat ment such as the application of radium before Wertheim s operation or radium treatment of the primary growth followed by bilateral iliac lymphadenectomy have some support but it must not be forgotten that for the patient this involves the discomfort of both treatments—perhaps two or more applications of radium and then a major operation—and so far no great improvement in the cure rate has been shown

On the other hand for cancer of the body of the uterus there is a general ten dency to extend the operative procedure with advantage in reducing the frequency of local recurrence in the vaginal vault and an operation that is little short of a full Wertheim s operation is usually performed Here too radium applications may be made before or after operation

CHAPTER 16

ACUTE ABDOMINAL DISEASES IN CHILDHOOD

D F ELLISON NASH

THE natural history of disease in infancy and childhood differs from that in the adult mainly in the rate of progress Diagnosis is therefore a more urgent problem and delay is more dangerous when surgical action is called for In family practice in Great Britain the universal fear is of missing the diagnosis of acute appendicitis and many a child is sent to hospital for that single reason the symptoms then settle and physical signs (if any were present) subside many a child returns home with an intact abdomen and no diagnosis This consideration applies mostly to the toddlers and to school children In the first two years of life a more common crisis is that of suspected intestinal obstruction—the child with a screaming attack and the ever present thought of intussusception

HOME OR HOSPITAL

Early observation

In considering the indications for surgical intervention in abdominal disease in the child the primary decision is whether he should be removed to hospital or should remain in the family circle So many of the non surgical conditions in childhood are best treated in the patient s home thus eliminating much parental anxiety as well as the ever present risk of hospital cross infection A great deal rests upon the powers of observation of the parents Early diagnosis depends on th initial detection by the parent that the child s behaviour has deviated from normal This is particularly shown in relation to the child s feeding habits The younger the infant the more fully informed is the mother about his inclination for food The breast fed or bottle fed baby who develops a reluctance to feed will call attention to himself within 3–4 hours of the first symptom Toddlers who go to day nursery may be off their food for 8 hours before anyone realizes the change breakfast is half eaten the midday meal is perhaps picked about but unless the child has vomited or complained of pain the mother is unlikely to be told of this minor abnormality and thus it is the late evening before the child s anorexia is fully appreciated The healthy older school child in the early stages of acute appendicitis may have no anorexia or at least not miss a regular meal Nevertheless if such a child deliberately declines the usual meal it is a real pointer to abdominal mischief

TYPES OF PAIN

There are three types of abdominal pain (1) the constant ache of distension whether this be of a single loop of intestine of the colon or of the whole abdomen (2) a severe ache accompanied by fever arising from an inflammatory process which is usually sufficiently localized for the patient to indicate its position and (3) the colicky pain of muscle spasm whether this be due to inflammation or to obstruction and whether it be in the biliary tract the alimentary tract or

by over clever attempts to draw the peritoneum closely round the ovarian pedicle The fear of malignant disease in ovaries that are left is brought forward as a reason for their removal, but the risk is slight Statistics are less impressive on this point than Victor Bonney's remark, at the end of a surgical lifetime with hysterectomies numbered in thousands rather than hundreds that he could count on the fingers of one hand the number of instances in which he had encountered cancer in ovaries that had been left in place Even now a few surgeons affirm that menopausal flushes will not occur after surgical ablation of the ovaries but this has been shown to be untrue by all recent observers who have studied the point It is of course true that after the uterus has been removed oestrogens can be given to control flushes without fear of uterine bleeding but that does not justify the unnecessary sacrifice of the ovaries

A second point that may need discussion before operation is the effect of hysterectomy on subsequent coitus and here masculine misconceptions about the functions of the uterus sometimes need correction After the application of radium for cancer of the cervix or after Wertheim s hysterectomy there is likely to be either stenosis or shortening of the vagina sometimes to a degree that makes coitus impossible but this can hardly be considered when the cure of cancer and the saving of life itself is the aim In other cases even if the cervix is removed there is no reason at all why hysterectomy should shorten the vagina to any significant degree or interfere in any physical way with subsequent coitus Unless there are extreme technical difficulties as for example in the case of endometriosis of the rectovaginal septum mentioned above total hysterectomy is always to be preferred as cancer of the cervical stump is far from rare in parous women and in addition the parous cervix is not infrequently the source of discharge

Another idea that some layfolk hold is that hysterectomy or removal of the ovaries so far as they distinguish these procedures, may cause mental change Mental breakdown may certainly occur after major operations in both men and women and more commonly as middle age is passed but this is not due to any hormonal change brought about by the operation but rather to the total situation of stress and anxiety and change of environment Patients who break down in this way often have a background of instability adverse inheritance or other pre existing psychiatric factors The rarity of such an event may be illustrated by the fact that in nearly 25 years of practice the author has never met it after hysterectomy although he has seen it after other operations

On the other hand one other late result of hysterectomy is perhaps too often disregarded In patients with post operative retention or cystitis it is important to ensure that bladder tone returns to normal before they are discharged from surgical care Careful check on the residual urine in the ward and if necessary regular catheterization together with the treatment of any urinary infection will deal with the few cases of atony that follow ordinary hysterectomy but more prolonged and troublesome atony may follow Wertheim s operation in which the nerve supply to the bladder is inevitably divided during the removal of the pelvic cellular tissue Prolonged catheterization is sometimes required but fortunately even in these cases resolution usually follows

As one who conducts his own post operative clinic and so sees every patient after operation the author can safely affirm that hysterectomy provided that the indications for it are chosen with some conservatism is an operation for which those who undergo it are usually grateful

number of children who reach the hospital emergency service with abdominal pain have had their tonsils inspected Unfortunately from time to time measles German m asles and tonsillitis perhaps because of their involvement of the lymphatic tissue in the abdomen are accompanied by real acute appendicitis which has been known to be fulminating and in need of immediate surgery A search for Koplik s spots inspection of the pharynx and palpation of the epitrochlear lymph nodes may well make one less suspicious of the appendix and save an unnecessary journey to hospital for a patient with a generalized lymphadenopathy Deep iliac lymphadenitis from septic lesions on the legs or buttocks may also simulate acute appendicitis

The decision to admit a child to hospital has *quite often to be taken before* an accurate diagnosis can be made If there is substantial doubt as to whether surgical intervention may be called for few parents will be happy to carry the anxiety of the child remaining at home Children over the age of 5 years seem in some particular way to sense the need and urgency and certainly in considera tion of doubtful appendicitis a child s resignation to being *admitted to hospital* with a view to operation is a further assurance to the doctor that operation is needed It is very rare for a child with a serious abdominal lesion to protest about hospital admission

Hidden mischief

A baby s napkin or toddler s knickers may hide the cause of acute abdominal distress *Paraphimosis* ulceration of the urinary meatus torsion of the ectopic testis or of tiny congenital cysts in the testis or epididymis can each stimulate peritonitis A septic toe or infected abrasion on the knee may give rise to deep iliac adenitis the primary lesion on the leg may have healed already and look innocent Full examination is thus essential and is best undertaken in the shy or worried child by starting at the periphery and working towards the abdomen but leaving until the end both the rectal and pharyngeal examination—the latter by producing retching is often the worst stimulation to abdominal pain

In setting out specific indications for surgical treatment one must assume that full examination has been carried out bearing in mind all the points mentioned above It is then reasonable to consider some common conditions and appropriate symptoms and signs wh ch have been found to be of value in reaching a decision to operate

NEONATAL INTESTINAL OBSTRUCTION

The operative treatment of duodenal or intestinal atresia is now quite often successful but the outcome depends entirely upon early diagnosis Other common causes of neonatal obstruction are malrotation and volvulus around bands It must be a gold n rule that a baby who vomits bile stained fluid is to be regarded as having obstruction whether or not there is abdominal distension or constipation This symptom indicates the need for urg nt admission to a specializ d unit and it cannot be emphasized too firmly that neglect of biliary vomiting in the first few days of life may prove fatal Distension with absolute constipation may arise from an undetected obliteration of the anus or lower rectum A perineal dimple may be present and an escape of meconium from a tiny pinhole in the normal anal position or from a fistula into the vagina or urethra may have misled the midwife or doctor Plain radiographic examination of the abdomen is an essential and this can be carried out in a baby with the simplest portable x ray set

the renal tract Children over the age of 6 years are usually able to give a fairly accurate description of the type of pain when cross examined Infants and toddlers are unable to do this and many young children from hearing the word in common usage, describe all pain as a " headache ' Apart from what a child may be able to say about pain, the first type—the ache of distension—is indicated by whimpering, anorexia and frequently pallor produced by and associated with nausea The second type, the severe aching pain of inflammation with pyrexia is associated usually with drowsiness crying and irritability when disturbed The screaming attacks and pallor associated with colic the third type are always self evident

SITE OF PAIN

Most children up to the age of 6 years refer all pain arising from abdominal viscera to the centre of the abdomen Even renal pain is indicated by a hand placed on the front of the abdomen in clear distinction from the action taken by an adult who invariably places a hand or a thumb in the loin Thus pyelitis and calculus can produce a symptomatology almost identical with that of acute appendicitis, particularly when in the latter condition the appendix is hanging over the brim of the pelvis and causing frequency of micturition Certain of the child s viscera are individually large relative to the total size of the abdomen For instance a long appendix in an infant may well be adherent to the parietes in the left iliac fossa giving very misleading localization The bladder when distended is very high and the distance between the gall bladder and the caecum may be less than 4 cm even in a toddler whose organs are normally disposed The subjective localization of pain and the care taken in accurate observation must take these facts into account

CONFUSING FACTORS

With the above mentioned simple basic considerations of symptoms and their interpretation must go a reminder of three further facts

Diarrhoea

In childhood diarrhoea may be the herald of any acute abdominal lesion—that is, one or two extra loose actions On the other hand vomiting extreme tenderness and board like rigidity may be the herald of impending infective diarrhoea Use of a stethoscope may distinguish between these two In the first instance excessive peristalsis will cease soon after the onset of pain if the trouble is for example, acute appendicitis whereas the persistence of vigorous peristalsis in a developing enteritis will exclude a diagnosis of established peritonitis

The enteromesenteric lymph field

The second fact to be recalled is that the great imitator in the abdomen is the enteromesenteric lymph field Many of the acute infective illnesses of childhood are associated with an initial lymphadenopathy The lymph follicles in the bowel and particularly in the appendix and the mesenteric lymph nodes take part in this reaction Measles and German measles very frequently present as acute abdominal conditions and the commonest misdiagnosis in children sent to hospital as having acute appendicitis is simple streptococcal tonsillitis This is because many children have an associated abdominal lymphadenitis A remarkably small

number of children who reach the hospital emergency service with abdominal pain have had their tonsils inspected Unfortunately from time to time measles German measles and tonsillitis perhaps because of their involvement of the lymphatic tissue in the abdomen are accompanied by real acute appendicitis which has been known to be fulminating and in need of immediate surgery A search for Koplik s spots inspection of the pharynx and palpation of the epitrochlear lymph nodes may well make one less suspicious of the appendix and save an unnecessary journey to hospital for a patient with a generalized lymphadenopathy Deep iliac lymphadenitis from septic lesions on the legs or buttocks may also simulate acute appendicitis

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CONGENITAL PYLORIC STENOSIS

Many paediatric centres today look upon Ramstedt s operation (pyloromyotomy) as having been superseded by the use of spasmolytic drugs such as Eumydrin (atropine methonitrate) Nevertheless congenital pyloric stenosis often comes to light as an acute emergency as the symptoms rarely commence until the second week of life and frequently not until the third or fourth weeks Forceful vomiting and constipation always suggest the presence of pyloric obstruction provided the vomit does not contain bile No firm diagnosis can be made however unless the tumour has been felt Palpation of the infant s abdomen must be carried out from each side with a hand placed underneath the bedclothes If this condition is suspected one should sit on the left side of the baby s cot and palpate with the left hand for at least 20 minutes and during a period which includes the administration of a feed A pyloric tumour is felt when the pylorus contracts and is usually in the position of the right kidney It is not in the midline as the pylorus is pushed even further to the right of its normal position by the hypertrophied stomach Whether immediate surgery is indicated when the diagnosis has been established is a matter of opinion The operation is carried out under local anaesthesia and requires no pre operative correction of fluid balance as subcutaneous saline solution can be given immediately with Hyalase surgical relief of this obstruction should be undertaken as an emergency procedure Three or four days in hospital is adequate provided there can be some domestic supervision There is virtually no operative mortality The alternative medical treatment of pyloric stenosis demands several weeks skilled nursing and incurs a very heavy risk of cross infection during the prolonged stay in hospital The choice of treatment is thus a matter of balancing the risks

INTUSSUSCEPTION

Intussusception usually occurs some time between 6 months and 2 years and is extremely rare over the age of 4 years When it does occur in the older children it is almost invariably associated with a Meckel s diverticulum which acts as the starting point for the bowel inversion The condition may arise during a mild intestinal upset from a change of diet In approximately 50 per cent of the cases there is no passage of blood nor is blood found on the examining finger The diagnosis depends on the history of severe attacks of colic and on careful examination of the abdomen As with all babies abdominal palpation of the abdomen is carried out without disturbing the child and with a hand placed beneath the bedclothes The emptiness of the right iliac fossa (Dance s sign) is a reality, if one feels a distended gurgling or contracting caecum the diagnosis of intussusception is virtually ruled out As with pyloric stenosis the palpation of a tumour depends on the patience of the examiner and even in a reasonably early case the mass is felt in the region of the transverse colon Thus very severe attacks of colic associated with a palpable tumour or the passage of blood must be taken as urgent indications for surgery The temperature and pulse rate are unaltered in the early stages and vomiting is unusual A picture of intussusception is therefore not that of an ill child passing blood with its stools but is rather one of a well child who is hungry sleeping between attacks has a normal temperature and pulse but is being disturbed by violent spasms of abdominal pain The passage of one or perhaps two normal stools after the onset of the symptoms adds weight to the diagnosis and recurrent colic of more than 4 hours duration is an indication for hospital observation

Operation is carried out through a transverse muscle splitting incision which can readily be enlarged if resection is necessary A subsequent attack of intus susception is a rarity but to discourage this the terminal ileum is angulated on the caecum by a simple seromuscular suture

Radiographic examination is useful in the diagnosis but it may be very mis leading If facilities are available for a screen examination using a thin barium enema the diagnosis can be made with certainty but this is of value in older children rather than in those in their first year of life

In some centres the hydraulic method of reducing an intussusception by means of a barium enema under radiological control has produced favourable results It is however time consuming and has less certainty and involves greater risk than a straightforward laparotomy which settles the issue and deals with any concomitant pathology

ACUTE APPENDICITIS

Reference has already been made to some of the diagnostic difficulties encoun tered in children suspected of having this condition A simple review of the main clinical presentations of acute appendicitis is useful in comparing differential diagnosis in the child with that in the adult (Table I) The pathological changes of acute appendicitis may progress with great rapidity in the child and it is only in the early stages of the disease that the acute obstructive lesion can with any certainty be differentiated from the acute catarrhal lesion The distinction depends largely upon the history rather than the physical signs It is however in this early stage that the family doctor most needs to be able to make an accurate diagnosis and to have some idea how long it is safe to wait before admitting a child to hospital True appendicitis of the catarrhal or obstructive variety usually progresses with sufficient rapidity for the diagnosis to be very clear-cut and obvious by the time the child reaches hospital but there is a dangerous phase when the physical signs are almost absent and it is at this point that hospital house officers are apt to ignore the observations of the family doctor who has asked for the child to be admitted

Common conditions which imitate appendicitis both in their history and physical signs are indicated in Table I and unless one can find specific evidence of other disease (such as glandular fever from generalized adenitis or measles from Koplik s spots) it is a wise and safe rule to regard appendicectomy as a justifiable procedure The approach to a case of suspected appendicitis in a child should therefore be along the line of exclusion of common imitating lesions Perhaps one of the most helpful observations is that where mesenteric adenitis is the cause of the symptoms the tenderness is along the line of the right rectus muscle quite often accompanied by some guarding extending up to the root of the mesentery Only very rarely is the tenderness low in the iliac fossa

No one with experience of acute appendicitis would attempt to deny the very characteristic fetor oris which seems to be more marked in childhood than with older patients In the later stages when there is a generalized toxaemia and high fever this fetor is marked by the smell of acetone

The acute obstructive variety of appendicitis is the one which is most apt to proceed to gangrene and in small boys the cremasteric reflex sign is of great diagnostic value In the normal individual the right testis is briskly elevated as soon as the skin of the lower abdomen is touched To elicit this physical sign in appendicitis the doctor s right hand is placed across the child s right iliac

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along th line of the right ureter but the tongue is clean, there is no fetor and the urine is probably hazy Microscopic examination of the urine in the early stages before hospital admission is not always practicable and in the absence of urinary symptoms it is probably unwise to make a diagnosis of pyelitis if the physical signs suggest appendicitis Inflammation of a pelvic appendix often produces frequency of micturition dysuria and sometimes retention Urine examination however shows only scanty pus and red cells An obstructed infected ureter will similarly be accompanied by a relatively normal urine

Appendicitis with localization

The retrocaecal or pelvic appendix may become walled off from the general peritoneal cavity by adherent bowel or omentum The acute infective process produces a mass which may or may not suppurate This inflammatory tumour rarely bursts into the peritoneal cavity and the presence of a mass felt on abdominal palpation is an indication for non intervention in children Abdominal palpation is difficult on account of general discomfort Antibiotic treatment should be used only if toxaemia is marked The pelvic mass sometimes discharges through the rectum and may be safely encouraged to do so by hot rectal washouts twice daily (up to 3 l of hot water should be used but not more than 100 ml at a time should be run in to avoid absorption)

The younger the child the more mobile and flowing is the omentum In babies it is very thin and plays little part in forming the mass It is however a fallacious tradition that babies do not form an inflammatory mass The condition is not uncommon

Intestinal obstruction from ileus duplex (a loop in the inflammatory mass) or from mechanical blocking by adhesion may demand surgical intervention (see Meckel s diverticulum)

If there is no evidence of obstruction normal high calorie fluid diet should continue There is no need for a starvation regime with gastric suction unless vomiting has been a marked feature

TABLE II

ANALYSIS OF 1 000 CONSECUTIVE APPENDICECTOMIES IN CHILDHOOD CHILDREN S HOSPITAL, SYDENHAM LONDON

652 (male 328 female 324) performed as emergency operations
348 (male 166 female 182) performed as list cases

Age (years)	*Emergency*	*List*	*Total*
0–1	Nil	Nil	Nil
2–4	102	34	136
5–10	328	190	518
11+	222	124	346

Mortality 1 child Peritonitis of sudden onset 8 days after operation for gangrenous appendicitis

The higher relative number of list appendicectomies in the 11 + age group is expected since these have been postponed from recurrent attacks

Appendicectomy in childhood carries a very low morbidity and almost negligible mortality (Table II) It is an operation which should be performed without hesitation in suspected cases where there is no contraindication On the other hand when the symptoms are mild and the physical signs doubtful even if other diagnoses such as poliomyelitis and measles have been excluded school examinations holidays or psychological factors may make it advisable to avoid emergency

fossa and is held gently in position until the right testis drops back into the scrotum following the initial abdominal response By gentle but quick flexion of the fingers at the metacarpal joints one can elicit any " deep tenderness and if this " flick ' is accompanied by cremaster contraction and elevation of the testis it is a sure sign of true abdominal mischief If this sign is strongly present even if the tongue is clean and there is no fetor oris, but a history suggestive of appendicitis there should be no hesitation in operating

TABLE I

CLINICAL PRESENTATIONS AND IMITATING LESIONS IN THE CHILD AND THE ADULT

Clinical type	*Main features*	*Imitating lesions*		*Diagnostic points*
		Adult	*Child*	
Acute catarrhal appendicitis	Anorexia Low pyrexia R.I F tenderness	Enteritis Adenitis Salpingitis Ectopic preg nancy	Mesenteric adenitis in acute specific fevers e g measles rubella glandu lar fever poliomyelitis	Circumoral pallor Koplik s spots Tenderness along line of right rectus muscle
Acute obstructive appendicitis	Severe colic initially without fever	Intestinal biliary pan creatic or renal colic Ectopic pregnancy	Intussusception Dietetic indis cretion Reflex renal colic (urethral meatitis)	General pallor No fever Retention in urinary tract lesions
Fulminating appendicitis	Shock Rigidity Ileus Toxaemia	Perforated pep tic ulcer Pneumonia Ectopic pregnancy	Primary peri tonitis (girls) Pneumonia Diabetic crisis	White blood cells Chest radio- graphy Urine test
Appendix abscess	Tumour in R I F or pelvis Swinging fever Leucocytosis	Carcinoma	Meckel s diverti culitis Deep iliac adenitis (from leg sepsis)	An ill child with toxaemia and abdominal mass Mobility of the mass suggests Meckel s diverti culum rather than appendicitis

Rectal examination is extremely misleading in childhood So called ' high rectal tenderness depends entirely on the length of the operator s finger and the strength of his push On the other hand a very careful visual inspection of the anus with the skin folds separated in a good light may well reveal the presence of active threadworms and this will explain the abdominal symptoms in a number of cases Persistent and heavy infestation with threadworms frequently demands appendicectomy for its cure

Children in the toddler stage have generalized abdominal pain and rigidity with lobar pneumonia Unless there is consistent evidence of low right sided abdominal tenderness one should not invoke a diagnosis of appendicitis if there is evidence of acute respiratory disease Nevertheless such a child should be sent to hospital and a few hours observation may settle the issue Pyelitis more common in girls than in boys is frequently accompanied by tenderness

First the long standing history of indigestion and colic in an otherwise normal girl should have led to exploration at an earlier date—a year or so previously Recurrent abdominal colic is an organic and not a functional disease

Secondly the family doctor s initial observation of board like rigidity suggests that he saw her very soon after the incident of perforation but the vomiting and loose motions gave support to a diagnosis of gastroenteritis The subsequent distension but lack of evidence of peritonitis indicated mechanical obstruction —a fact confirmed by hearing very vigorous peristalsis on auscultation

Meckel s diverticulitis in many ways behaves like and resembles appendicitis It is not amenable to conservative treatment since the portion of intestinal tract involved cannot be defunctioned by the inflammatory process without causing obstruction to the small bowel lumen The presence of localized tenderness or mass in the midline or to the left side of the pelvis suggests the possibility of a diverticulum when other symptoms and signs have raised the diagnosis of appendicitis

A diverticulum as the head of an intussusception can only be diagnosed at operation undertaken for the relief of intussusception There are no distinctive features though it is in the older patients with intussusception that one is most likely to find a diverticulum containing a knob of ectopic pancreas as the starting point Recurrent bouts of intussusception with spontaneous reduction may occur giving a clinical picture indistinguishable from other types of recurrent intestinal colic or from appendicular colic Barium follow through or enema examination rarely gives any help in the *diagnosis*

If the diverticulum remains attached to the umbilicus by a strand of tissue representing the obliterated *yolk stalk this* may be a cause of mechanical intestinal obstruction by volvulus or isolated loop passing round the strand

It will be clear that *with these* capricious clinical presentations Meckel s diverticulum is worthy of greater consideration than it usually receives as a possible cause of acute abdominal symptoms in childhood For this reason hesitancy over exploring an abdomen when there is no classical indication may lead to prolonged ill health or recurrent family crises and child misery

hospital admission on some occasions Those of us who work in children s hospitals probably err on the conservative side perhaps from intellectual pride we defer operation symptoms and signs subside and no one knows whether the lesion was appendicitis or not until the next attack Since the introduction of the National Health Service in Great Britain the domiciliary consultation has made it possible to prevent a good many unnecessary admissions by allowing the consultant to see a child at the onset of its illness and enabling the family doctor to share his responsibility until further symptoms or signs develop Acute infectious illness can thus be excluded from the surgical wards

MECKEL'S DIVERTICULUM

There are three main clinical types of disease associated with congenital persistence of the vitello intestinal tract (1) ulcer type—haemorrhage or perforation (2) diverticulitis and (3) obstructive type—intussusception or bands

Many diverticula contain ectopic gastric acid secreting mucosa, and peptic ulcers are common in the diverticulum or on the neighbouring ileum Massive haemorrhage may occur the child passes chocolate brown stools and is collapsed in less dramatic cases the presenting feature is pallor from anaemia and only by persistent history making does one elicit any information about dark stools The blood is changed by digestion but if haemorrhage is very severe the stool may nearly resemble the red currant jelly of intussusception The following case history illustrates the confusing picture which may arise from ulceration

Case history —A girl aged 15 years had all her life suffered from indigestion By this she meant rumbling especially after food with occasional colicky pain She had been under observation in hospital once for suspected appendicitis Now for 6 hours she had been vomiting and had two loose stools of normal colour She had recurrent severe low abdominal pain and general soreness of the lower abdomen Her temperature was 101 F and pulse rate 100 per minute The family doctor found her with a clean tongue her abdomen exhibited board like rigidity but when she was reassured and made to breathe deeply she relaxed and the rigidity and tenderness were then less definite and limited to the suprapubic area slightly to the left The doctor thought she had a mild infective enteritis but he had a sleepless night thinking he had probably missed a general peritonitis Early next day the girl s rigidity had gone She was distended and tender in the lower abdomen Her bowels acted three times with loose stools on this second day and she vomited only once She continued to take light food On the third day she was still having bouts of severe pain and loose stools Her abdomen was distended and peristaltic sounds were very loud and prolonged After examination she experienced a bout of colic and passed much flatus the abdomen softened When she was transferred to hospital on the fourth day all agglutination tests were negative and her white blood cell count was 18 000 cells per cmm Her tongue was furred and moist she felt better and her appetite was returning There was suprapubic tenderness and a suggestion of a pelvic mass but this was difficult to assess Radiographic examination of the abdomen showed considerable increase of gas shadows On the fifth day it was felt wise to explore the abdomen as the pulse rate had risen to 120 per minute A diagnosis of Meckel s diverticulitis with localization seemed most probable but as there was clearly intermittent intestinal obstruction delay was inadvisable

Laparotomy revealed an abscess high in the pelvis between coils of small bowel and arising from a perforated peptic ulcer of the ileum opposite a small Meckel s diverticulum firmly bound to the mesentery The ileum was being obstructed by the inflammatory mass which made bowel resection too hazardous The diverticulum was excised from the ileal wall Its base and the perforation were closed by simple sutures the pelvis was drained and recovery was uneventful

The above case is described in detail because it illustrates so many diagnostic points

in the area sharply localized owing to strains by abnormal exercise following parturition or post-operatively when muscles have become slack

It is unusual for minor degrees of postural deformity of the spine to produce pain but more obvious scoliosis can do so and should be readily appreciated Gross changes in the vertebral column owing to osteoarthritis or collapse from tuberculosis or neoplasm more commonly produce pain in both iliac fossae but it can on occasions be unilateral These root pains are so typical that they are not likely to be confused with visceral disease Many surgeons must have been caught out at one time or another by an attack of herpes zoster simulating abdominal disease only later to be confounded by the appearance of the typical vesicles Post herpetic neuralgia is an extremely intractable condition and difficult to relieve but one which is unlikely to be missed if the previous history is known Inguinal or femoral hernias may produce a dull ache in the right iliac fossa but these should present no difficulty in diagnosis when the patient is examined in the standing position

UROLOGICAL PAIN

Pain may be referred to the right iliac fossa from kidney ureter bladder and prostate The two conditions however most likely to be missed or con fused with chronic appendicitis are hydronephrosis and ureteric calculus In the latter case the scar of a small grid iron incision is a not infrequent physical sign on examination

Urinary calculi

The very great majority of ureteric calculi are composed of calcium oxalate or mixed oxalate and phosphate and are therefore radio opaque It is possible for accretions of oxalate crystals no bigger than half a pin head to cause colic and haematuria and these would of course be missed on a straight radiograph of the abdomen Red cells should therefore always be looked for during an acute attack of pain which could possibly be ureteric colic Their absence however, is not an absolute bar to this diagnosis for in long standing impacted stones no blood may be found In children with urinary calculi nearly 90 per cent have infected urine The finding of pus in the urine is therefore a very good diagnostic screen which in the main will direct investigations towards the urinary tract When ureteric calculi are found the great majority of small stones are passed spontaneously if sufficient time is allowed and these should therefore be treated expectantly unless infection of the urine or dilatation of the affected ureter or kidney occurs Small stones lying in the renal pelvis are in general more damaging to the kidney than the larger stag horn calculi and more likely to give rise to vomiting and severe loin pain which may be referred to the right iliac fossa The stag horn calculi on the other hand are more likely to give rise to pyuria and recurrent fever and pain often of a dull aching character It is of course well known that these patients are often referred in the first instance to ortho paedic departments as cases of backache Wherever a stone is present however a straight radiograph of the abdomen will usually demonstrate a shadow for the majority are radio-opaque

Hydronephrosis

Pain due to a hydronephrosis is much more confusing compared with that due to a calculus and is more likely to be misdiagnosed and a misguided

stimulus for it appears that with very strong stimulation the nerve impulses overlap into adjacent neurones and cause pain over a wider area One other factor could also perhaps be noted as relevant in this connexion and that is the variation in the individual threshold of pain However interpreted whether in terms of nerve roots or other physical factors, pain is essentially a mental reaction Although surgeons must always be looking for and excluding organic disease some of which may be alleviated by operative procedures sight must not be lost of the functional causes of pain which may be projected by the patient to the right iliac fossa

ANALYSIS OF PAIN

It will be clear that pain in the right iliac fossa can arise in a great variety of ways physiologically and pathologically, and that interpretation of this symptom will in many instances be no easy matter The majority of patients with persistent pain in the right lower quadrant will be referred to the surgeon with a ready made diagnosis of " grumbling appendix Before accepting this diagnosis on its face value however it is imperative to bear in mind the other possibilities which though they present rather a formidable list must be excluded if a correct diagnosis and proper treatment are to be arrived at

Signposts as to which system is at fault are provided in the first instance by the history and age group It may perhaps seem presumptuous to stress the value of history taking in the diagnosis of abdominal pain but there is no single part of the investigation that in the great majority of cases is more likely to yield valuable information even more informative than the physical examination Inquiry must be made as to the exact location of the pain its quality, severity duration and radiation Pain that is often vaguely indicated by the patient as being in the right iliac fossa may turn out on closer inspection to lie over the iliac crest or inguinal canal A precise history of the time of onset duration and location combined with great severity of pain is often almost diagnostic, as for example in biliary or renal colic Such a history at the time or in retrospect leaves no doubt as to the genuine nature of the symptom or its organic origin The dull aching pain lasting perhaps for several days at a time is much more difficult to assess as is, in the other extreme the girl with the dragging or stabbing sensation in the right iliac fossa lasting only a minute or two at a time or the middle aged lady who has allegedly not been free of pain day or night for many years but yet looks in remarkably good health The relationship of pain to exercise and movement its association with food or bowel action or to disturb ances of micturition or menstruation will help in determining what special investigations are indicated The more the patient with this symptom is allowed to talk the more likely is one to achieve the correct diagnosis and possibly avoid an unnecessary operation The family history and general background are also of value and may disclose a cancer phobia which will permit a ready assurance and relieve the pain without further investigations The various groups of causes will be discussed separately

NEUROLOGICAL, MUSCULAR AND SKELETAL PAIN

The abdominal wall the nerves supplying it and the spine supporting it can each be the cause of chronic pain in the right lower quadrant These should be readily discernible since the pain will in general be worse on moving or exercise and relieved by recumbency Tender points may be found on gentle palpation

Testicular pain

Testicular pain as one would expect from its nerve supply is of interest in that it is referred to the iliac fossa This may occur in orchitis epididymo orchitis in undescended testicle and in chronic torsion of the testicle and also owing to the drag of a large hydrocele of the tunica vaginalis All these may produce a dull aching pain in the iliac fossa but the diagnosis should be obvious and the treatment straightforward and effective

GYNAECOLOGICAL PAIN

Acute or chronic pain in the right iliac fossa may arise from lesions of the internal sex organs but need not necessarily be accompanied by other obvious gynaecological symptoms such as vaginal bleeding or discharge nor have any consistent relationship to the menstrual periods For this reason the true cause is not always easily distinguished from lesions in the intestinal tract or elsewhere Pelvic examination will be made to determine the presence of a mobile lump a fixed mass localized tenderness or a hot and acutely tender vagina which will direct attention to gynaecological conditions The commonest such causes of acute pain are tubo-ovarian inflammation torsion of or haemorrhage into ovarian cysts and bleeding from ectopic gestation The low abdominal pain occurring regularly about the fourteenth day of the menstrual cycle so-called Mittelschmerz is due to bleeding from a ruptured graafian follicle Such patients are not infrequently referred as appendicitis but when the true cause is recognized require no surgical intervention Chronic pain may result from recurring attacks of tubo ovarian infection with or without hydrosalpinx or pyosalpinx endometriosis tuberculous salpingitis or from the weight of larger simple cysts such as an ovarian dermoid

Endometriosis may occur without pain but the classical triad of acquired dyspareunia dysmenorrhoea and menorrhagia associated with chocolate cysts is more usual.

Tuberculous salpingitis is less common and may present with pain or as infertility and in contradistinction to pyogenic salpingitis is almost invariably unilateral The diagnosis is suggested by evening fever a raised erythrocyte sedimentation rate and confirmed by histological examination of an endometrial biopsy specimen The importance of an accurate diagnosis cannot be over stressed in obtaining good results for the presence of a pelvic peritonitis or a mass in the pelvis is unless doubt exists as to its origin insufficient reason to embark on a laparotomy In addition the general surgeon must be as prepared to deal correctly with an unexpected gynaecological condition as the gynaecologist should be to treat a perforated appendix colonic diverticulitis or a carcinoma of the colon In patients with chronic pain a history of gynaecological symptoms or the pelvic findings mentioned above will allow adequate time to seek specialist gynaecological advice and treatment

Much has been written of ovarian pain which is alleged to be responsible for pain in many situations in the abdomen and elsewhere but the evidence is not always convincing and such pain may often be functional or due to lesions outside the ovary It is probable that pain from an ovary will only arise if there is infarction due to torsion haemorrhage into a cyst or rarely from the weight of a cyst The finding of a small follicular cyst either on pelvic examination or at the time of operation is not a sufficient explanation of chronic abdominal pain Such cysts which are normally about the size of a damson may be tender on

appendicectomy performed Pain was the presenting symptom in 127 cases of hydronephrosis analysed by Yates Bell (1953) of which only 66 were infected In children, however, the likelihood of infection is greater and the underlying cause is therefore usually discovered on account of the associated pyuria Large hydronephroses in infants often remain symptomless and the only sign is a palpable tumour in the abdomen In adults and often in children, it is extremely difficult to say on clinical examination whether a kidney is enlarged or not so that failure to palpate the organ by no means excludes a hydronephrosis as a cause of pain It is important to recognize the fact that it is during the developing stages of hydronephrosis that pain occurs and that once the kidney has become fully distended pain is less likely to occur, unless infection or a pyonephrosis supervenes Treatment, to be effective must be undertaken in the early stages with some form of pyeloplasty, for in the later stages only a nephrectomy is possible and the opportunity for conservative measures has been lost

The periodic attacks of pain due to hydronephrosis are of striking character usually in the loin and associated with vomiting but this is not so obvious in small children who complain of vague pain in the abdomen and are fractious and miserable The history may well suggest a recurrent appendicitis and result in a useless appendicectomy The story of the passage of large amounts of urine following the attack may give a clue to the correct diagnosis If the history of pain is not suggestive of a renal or ureteric lesion the absence of pus and blood from the urine and a normal straight radiograph of the abdomen and pelvis will exclude the vast majority of urinary lesions, with the exception of a sterile hydronephrosis Even so it is not necessary to order an intravenous pyelogram in every case of chronic pain in the right iliac fossa unless there is some definite pointer and it is clear that the attacks are absolutely genuine and explainable on no other grounds

Urinary infection

An acute pyogenic infection in the urinary tract may simulate an attack of acute appendicitis although in general the temperature is higher there are rigors loin pain and associated urinary symptoms Chronic recurrent pyelitis and cystitis is more likely to present with frequency, anaemia lassitude and chronic ill health and is unlikely to be confused with other conditions responsible for chronic pain in the right lower quadrant of the abdomen Difficulties, however arise in the patient who complains of frequency, and pain in the right iliac fossa when no pus cells are found in the urine even in the worst attacks These patients are not infrequently diagnosed as having cystitis without pus cells ever having been found in the urine and very often without there being any attacks of pyrexia It cannot be stressed too strongly that when looking for pus ordinary specimens of urine as passed from females of any age are virtually useless and that reliance should only be placed on catheter specimens examined within 12 hours It is only when pus is found in such specimens that the diagnosis of a urinary infection can be supported Frequency in the absence of pus is unlikely to be due to urinary infection and one must look much further to explain the pain in the right iliac fossa In these cases functional causes or an extravesical lesion such as an inflamed appendix or some gynaecological lesion lying adjacent to the bladder is much more likely to be responsible

entity but it is the misuse of the operation which must be condemned rather than the disease Moynihan (1910) and Trotter (1927) both considered that chronic appendicitis was a clinical entity and judging by the number of interval appendicectomies performed in hospitals this view must still obtain Even when histological proof of inflammation is lacking it does not necessarily imply that no good will result it may, perhaps by correction of some functional disorder of the intestine of which little is yet known Assessment of the results of treating chronic pain in the right iliac fossa by appendicectomy is not very realistic as success must depend so largely on the selection of cases and the clinical acumen of the surgeon

Radiological diagnosis

Controversy has existed for many years over the radiological diagnosis of chronic appendicitis On the whole the value of the barium meal and enema lies in their ability to exclude other intestinal disease which might be responsible for the symptoms and it is rare to find concrete evidence of chronic appendicular disease No one radiological sign is pathognomonic but combined with an intelligent clinical history the presence or absence of some of the following may tend to confirm or exonerate the appendix as a cause of symptoms Cochrane Shanks (1958) described the following signs as being of some possible value

(1) Non filling of the appendix (5–10 per cent of normal appendices do not fill)
(2) Incomplete filling
(3) Appendicular concretions
(4) Constant irregularity of the appendicular lumen
(5) Fixation of the appendix
(6) Tenderness over the appendicular shadow

Non-specific mesenteric adenitis

Non specific enlargement of the mesenteric lymph nodes may give rise to acute or chronic pain in the right iliac fossa in which situation the swollen lymph nodes are most commonly located The aetiology of this condition is obscure but it may be associated with upper respiratory tract infection with obvious respiratory symptoms and palpable cervical lymph nodes The temperature is often higher than one would expect in acute appendicitis In acute attacks observation after a few hours shows that the condition in the abdomen is stationary or sub siding operation may be avoided However where any possible doubt about the presence of acute appendicitis exists laparotomy should be resorted to for it is often extremely difficult to distinguish these two conditions If at operation the enlarged nodes are encountered with an appendix of normal appearance the latter should be removed and the child given a longer convalescence than usual to allow for the resolution of the inflamed lymph nodes The prognosis is excellent

Tuberculosis lymphadenitis

Abdominal tuberculosis is decreasing in frequency in company with tuberculosis in general and tuberculous lymph nodes and peritonitis are found far less often than formerly Calcified lymph nodes in the ileocaecal angle are capable of giving rise to pricking pain owing to the irritation of the parietal peritoneum by the spikey masses but the majority are too small and too well covered in

physical examination but they are frequent findings during the child bearing years and usually disappear without treatment When present the patient should be re examined in 6–8 weeks to make sure that the cyst has regressed Should it be larger, the question of malignancy arises and laparotomy should be recommended The larger multilocular follicular cysts associated with menorrhagia are a different problem and generally require surgery When found incidentally at operation for removal of the appendix, follicular cysts may be pricked or enucleated locally and bleeding follicles may be stitched over, but on no account must the ovary be removed

INTESTINAL PAIN

Lesions of the intestinal tract are the commonest cause of pain in the right iliac fossa and the great majority of these are infective in origin The symptoms and signs of acute appendicitis are too well known to warrant description and it is only necessary to stress that when diagnosed or reasonably suspected there is no alternative to prompt operative intervention expectant treatment with antibiotics being reserved only for localized appendiceal abscess

Chronic appendicitis

The term chronic appendicitis embraces subacute appendicitis chronic recurrent appendicitis, true obliterative appendicitis and mucocele of the appendix The two last named conditions are relatively rare while the distinction between acute and subacute appendicitis is largely a matter of degree The attacks of recurrent appendicitis may be typical in character, causing the patient to lay up for a day or two with pain, fever and anorexia, or they may be relatively mild and without any elevation of temperature in either case tenderness is likely to be present over the appendix at the time In the intervals patients are likely to feel well but some may complain of upper abdominal pain flatulence, intolerance of fatty food and irregularity of bowel action the so called appendicular dyspepsia' In these cases gall bladder disease and duodenal ulcer may have to be excluded by appropriate radiological examination before appendicectomy is advised

Removal of the appendix for recurrent appendicitis must not be lightly undertaken without careful exclusion of other disease but when cases are properly *chosen the operation results in a satisfactory rate of cure Without operation there is a considerable chance that mild attacks will continue or a more severe one supervene Moloney Russell and Wilson (1950) investigating* 1 074 cases of proven acute appendicitis in Oxford found that no less than 30 per cent gave a history of previous similar attacks When examined histologically the majority of appendices removed for chronic recurrent appendicitis will exhibit evidence of old inflammation fibrosis and obstruction to the lumen

The controversy concerning chronic appendicitis arises from the difficulty experienced in correlating a history of continual or intermittent pain with an *appendix which appears at operation to be lily white and devoid* of any histological abnormality It is for this reason that chronic appendicitis has received scant attention in some modern textbooks of surgery and gastroenterology and has been referred to by the more cynically minded as chronic remunerative appendicitis' Wholesale appendicectomy without adequate indication has undoubtedly given rise in the past to the bad results which one might expect and therefore to the suggestion that chronic appendicitis did not exist as an

though suggestive when positive by no means always excludes lesions of the intestinal tract when negative In contrast to carcinoma of the remainder of the colon carcinoma of the caecum is late in giving rise to pain in the right iliac fossa for this does not occur until the growth has extended through the peritoneal coat of the bowel owing to the fluid nature of contents obstruction is unusual unless intussusception occurs while anaemia is extremely common

Chronic inflammatory lesions

Chronic inflammatory conditions of the ileocaecal region such as actinomycosis amoebiasis and ileocaecal tuberculosis will obviously result in pain in the right iliac fossa Actinomycosis may present as a hard relatively painless mass in the right iliac fossa but is more usually diagnosed when a localized abscess and fistula develop following appendicectomy The prognosis was formerly poor but with iodides and penicillin in large doses resolution will generally occur Amoebiasis is a possible cause of chronic ill health and vague pain in the abdomen and right iliac fossa in anyone who has lived however long ago in endemic areas The only effective way to exclude this condition is to admit the patient to hospital and following purgation with salts to examine expeditiously ten stools for cysts and amoebae and to combine this with sigmoidoscopy If the findings are all negative one may assume for practical purposes that amoebiasis is not present.

Colon neurosis

None of the above organic conditions of the colon should present great difficulty in diagnosis but such is not the case with the much larger group known as colon neurosis or spastic colitis especially in relation to chronic appendicitis Ryle (1948) found that 36 per cent of his series of cases bore the scars of appendicectomy and yet had not been relieved by surgery Spriggs (1931) on the other hand in analysing 242 cases of functional disorder of the colon found the appendix diseased in 24 per cent The type of patient and his background is well known he may complain of pain in one or both iliac fossae associated with distension and wind and possibly constipated motions The prime requisite in treatment is full investigation and reassurance avoiding surgery The three S s referred to by Adler social relations subsistence and sexual troubles may not be capable of resolution but ill advised appendicectomy will only aggravate matters

MANAGEMENT

When summarizing this rather extensive differential diagnosis it must at once be admitted that very many of the patients will not present with symptoms or signs suggestive of definitive organic disease nor will they fit into any precise classification It is this group which confronts the family doctor and surgeon with the difficult decision as to whether or not exploration should be advised In practice the procedure depends largely on the age of the patient and management will therefore be discussed accordingly

Children

In childhood urinary infections and constipation are the conditions most likely to be confused with chronic appendicitis as a cause of right iliac fossa pain Many schoolchildren are extremely constipated as a result of irregular habits and the difficulty in having a proper bowel action before hurrying to school

fat to give rise to much trouble When very large, however, such masses of nodes should be removed Breaking down tuberculous nodes may occasionally be found causing small bowel obstruction due to adhesions, or to a localized inflammatory mass in the right iliac fossa These will respond to antituberculous chemotherapy

Regional ileitis

Regional ileitis, which was at one time confused with ileal tuberculosis is now well recognized as an entity on its own account even though its exact aetiology is unknown It consists of a chronic non specific granuloma with ulceration and cicatrization of the bowel and presents a trap for the unwary in the differential diagnosis of acute and chronic appendicitis, although it is far from common and in any large general hospital the number of cases admitted in one year will probably not exceed 5–10 Its greatest incidence occurs between the ages of 20–30 years equally in men and women It commonly presents with pain and tenderness in the right iliac fossa combined with vomiting and a slightly raised temperature in the acute phase it is therefore unlikely to be distinguished from acute appendicitis When the typical red and thickened loop of terminal ileum and the enlarged lymph nodes are found at the operation these must definitely be left alone and the appendix should not be removed for fear of producing a fistula Resolution will occur in about half of the cases presenting in this manner, but in the remainder obstructive features are likely to develop in later life and may require surgery

The more chronic cases of ileitis may present with pain in the right iliac fossa a mass or a fistula in this situation but the most constant symptom is that of colicky abdominal pain due to partial obstruction in three quarters of the patients diarrhoea occurs intermittently as well Rectal bleeding is unusual but loss of weight and anaemia are not uncommon Regional ileitis is one of those conditions which is sufficiently rare to be easily missed unless this possibility is constantly kept in mind whilst investigating patients with abdominal pain Very few chronic patients will recover without operative treatment, though whatever is done there will be a disappointingly large number of recurrences one third to one half may recur with extension of the di ease By pass operations though carrying a lower operative mortality may allow progression of the condition and the haematological changes associated with a blind loop of gut

Colonic pain

A major group of cases with pain in the right iliac fossa results from colonic pain due to spasm or peristalsis of the large bowel

Obstructive lesions

From the physiological point of view obstructive lesions of the colon should give rise to central colicky abdominal pain but in practice this is not always so, for the caecum being the most distensible portion of the large bowel bears the brunt of back pressure resulting in pain in the right iliac fossa Here lies an important pitfall in diagnosis for obstructive carcinoma of the left side of the colon may present as a dull ache in the right iliac fossa, when the appendix may be erroneously incriminated Pain associated with increasing constipation calls for investigation by sigmoidoscopy and barium enema since the majority of growths occur in the rectum and pelvic colon Examination for occult blood

though suggestive when positive by no means always excludes lesions of the intestinal tract when negative In contrast to carcinoma of the remainder of the colon carcinoma of the caecum is late in giving rise to pain in the right iliac fossa for this does not occur until the growth has extended through the peritoneal coat of the bowel owing to the fluid nature of contents obstruction is unusual unless intussusception occurs while anaemia is extremely common

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Though many will not admit to any abnormality the loaded rectum and palpable colon will be obvious Experienced practitioners and paediatricians see many hundreds of children with vague abdominal pain, the symptoms not conforming to any clear pattern and for which no cause can be found The vast majority of these will clear up on some simple symptomatic treatment and only need to be watched In those in whom pain in the right iliac fossa persists after this probationary period, especially if anorexia and occasional vomiting are occurring appendicectomy should be advised This is by far the safest course in children for all surgeons must recall young patients who have been referred as cases of chronic appendicitis and not operated on, only to be admitted later as emergencies with a genuine acute attack Not infrequently some delay in seeking advice on the second occasion may have resulted since the parents had been put off their guard by the previous opinion that operation was not required The risks of appendicectomy are negligible if skilled anaesthesia is available the results are excellent, and a possible source of future anxiety and danger is removed

Young adults

The great majority of patients fall into the young adult group which may be considered to include those up to about the age of 30 years with young women predominating Here a different range of possible diagnoses must be considered, the most frequent being pelvic disorders and urinary infection in women, and early duodenal ulceration and colonic neuroses in men Having excluded these other conditions appendicectomy must be approached with much more circumspection than in children In many the psychological background may be unsatisfactory and the heredity poor Spinsters apparently condemned to support aged relatives and lacking husband or child may manifest their dismay with lassitude, malaise and vague pain in the right iliac fossa It is extremely unusual for such patients to locate their pain for example in the left upper quadrant for they are well aware of the location of the appendix and use it as a respectable excuse for the pain and an escape from their predicament Married girls may be similarly afflicted as a result of an unhappy married life absence of a pregnancy or an unwanted one The spread of medical information by the press and wireless, although excellent in many ways does tend to produce a residuum of patients unduly concerned about their health and often about their appendices as well To achieve reassurance for both patient and surgeon full investigation including appropriate radiographs blood tests and urine examination should be carried out Such patients should not be operated on nor should in general the teenagers who complain of continual pain in the right iliac fossa It is unusual to find any organic cause for such pain and most patients grow out of it If on the other hand the patient is considered to have a genuine complaint of recurrent pain as opposed to continual pain associated with malaise and unexplained tummy upsets and investigations have proved negative as they probably will, appendicectomy should be advised Too great reliance should not be placed on a typical story of appendicitis nor on too precise reference of pain to one of the better known locations such as McBurney s point or Sherren s triangle for the appendix has many anatomical situations and a high retrocaecal or pelvic position may produce atypical symptoms

If appendicectomy is recommended it should be made clear to the patient that the operation will remove the offending organ prevent further attacks and allow an examination of adjacent organs in the abdomen to exclude other lesions

and approached in this way it is unusual for the patients to have further trouble The functional patients must be reassured and treated symptomatically although this may not succeed in relieving their symptoms appendicectomy will not do so either and must be studiously avoided There is possibly one exception to this rule and that is the occasional patient who has been told by another surgeon that he has a chronic appendix and in whom the conviction that this organ is at fault is so deeply ingrained that nothing short of removing it will succeed Despite rather a thin story in such cases it is generally not expedient to query the opinion of one s colleagues but to regard the operation in the nature of a psychological procedure and with adequate safeguards to carry it out Many of these will become most grateful patients

The over fifty age group

Acute appendicitis may occur at any age and octogenarians are by no means exempt but the symptomatology may be misleading and occasionally in old patients may resemble intestinal obstruction Conversely obstruction due to carcinoma of the colon or to diverticulitis may simulate appendicitis Not infrequently both may be found together when a carcinoma of the caecum obstructs the appendix and produces acute appendicitis The older the patient the less reliance must be placed on a diagnosis of chronic appendicitis a disease rare after the age of 50 years Every effort must be made to exclude other conditions and when no adequate cause can be found for continuing and genuine symptoms exploratory laparotomy must be seriously considered

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CHAPTER 18

HERNIA

ANDREW MONRO

THE modern outlook to the treatment of hernia has changed very considerably The present generation is much less tolerant of the restrictions inherent in conservative measures, and is more familiar with the subtleties and competence of the modern anaesthetist The fact that external support is often only a form of procrastination leading to serious troubles later on is gaining cognizance in the public mind With increased expectation of life, the man approaching retirement is anxious for economic as well as for general reasons to enjoy positive health and to be fully active It is important therefore, for his medical advisers to be able to give him sound advice to be able to lay the shibboleths of the past and yet not to be carried too far by the enthusiasms of the present

Unquestionably surgery is now far more universally applicable, age limits have been largely removed and results continually improved not only in lower recurrence rates but also in the withdrawal of restrictions after operation None the less conservative measures still have a part to play—if often only temporary—in the management of this common complaint

INGUINAL HERNIA

An inguinal hernia may occur at any age If present at birth, it may be small causing little trouble and appearing only when the child cries It may be larger coming down into the scrotum where it is liable to reach alarming proportions under stress More commonly a hernia is first seen in the early months of life by the mother but disappears when sought by the doctor repeated examinations may be necessary before the diagnosis is confirmed Childhood and school years are relatively free from the risk unless the hernia is associated with an undescended testis leaving the commonest time of occurrence to young adult life when the subject first exerts his full force at work, in the Services, or in vigorous physical exercise In the middle years of life hernias are not uncommon through previously strong muscles now beginning to lose their tone and perhaps to acquire some fat behind an office desk Finally in advancing years the combination of lax muscles and a cough are often deciding factors

An uncomplicated hernia may cause no symptoms beyond a feeling of weakness in the groin As it enlarges it is likely to become painful, particularly during muscular effort as in lifting or in turning in a particular position Pain may be sudden and sickening halting the patient in his tracks even making him drop what he is holding He becomes afraid of the pain and comes to avoid the actions which cause it Coughing or sneezing are particularly noxious and an attack of bronchitis may cause acute distress The memory of such an attack may make him limit his activity, give up his exercise and even become a premature invalid

Complications

Irreducibility

Irreducibility is likely to occur with the passage of time caused either by adhesion of the contents to the sac or by the deposition of fat within it Its content is then tethered in the groin and abdominal symptoms develop either in the form of difficulty with the bowels or at best of an aching dragging pain in the back With larger hernias the bladder may become involved at the neck of the sac and complete emptying of the bladder is compromised Infection follows with consequent retention of urine Alternatively the penis may be lost in the mass of the hernia the surrounding skin becomes infected and offensive with subsequent urinary infection Such a case can be diagnosed as the patient comes into the room and few plights are more pitiable

Strangulation

Strangulation may occur at any time particularly in indirect hernias where the neck of the hernia is small. Symptoms may be acute but are not always so Not infrequently after initial pain with perhaps only nausea the condition improves and advice may not be sought for 24 or 48 hours If the doctor then *fails to examine the hernial orifices* the stage is set for tragedy After 48 hours the mortality from strangulated hernia rises dramatically even with the most skilled treatment It is essential therefore in any such case to expose the abdomen in a good light and to examine the groins for a tense tender lump which gives no impulse on coughing Tenderness is not an entirely reliable sign and may be absent even when the sac contains gangrenous bowel If such a lump be present *the diagnosis is one of* strangulated h-rnia and treatment must be undertaken immediately Without treatment a strangulated hernia containing bowel is fatal either from intestinal obstruction or from general peritonitis as a result of rupture of the intestine at the neck of th. sac If only omentum is present in the hernia an abscess forms in the sac and may discharge externallv Physical signs at the time do not permit an accurate diagnosis as to whether bowel or omentum is present or the recognition of degrees of strangulation

Incarceration or impaction

Incarceration or impaction indicating obstruction to the passage of bowel content in a hernia occurs only in large umbilical and rarely in long standing inguinal hernias Adhesions between coils of intestine particularly colon in the sac cause gradually increasing difficulty with the bowels the contents of the sac become heavy pulling on the mesentery and causing pain the whole condition is aggravated by pre-existing cough and perhaps urinary troubles In view of the gradual onset of his complaint the patient may not easily be persuaded that a single vomit combined with tenderness of his hernia are sufficient grounds for urgent admission to hospital *Untreat-d* an incarcerated hernia becomes loaded with faeces leading to a compl te large bowel obstruction with abdominal distension Vomiting is unfortunately a late sign More often than not in such a hernia o-. or more of the coils of intestine involved are found to have their blood supply impaired in fact to be strangulated

At all times therefore the diagnosis of incarceration in a hernia i a dangerous one in fact it is probably strangulated and valuable time may be lost before treatment is instituted If there is doubt not more than 4 hours should be spent

in giving enemas at the patient's home Unless complete relief is obtained a diagnosis of strangulation should be made and the patient admitted to hospital

The major complications of a hernia are therefore serious and threaten life, failure on the part of the medical attendant to examine the hernial orifices or to *know that a strangulated* hernia *need not be tender* may be matters of life and death

Minor complications

The minor complications of a hernia are not so much discussed They are none the less very real to its possessor It may make him limit his activity give up healthy outdoor pursuits restrict the help he gives his wife in the house and dread the winter when he is liable to bronchitis, he may in fact become a semi invalid whose life revolves round his hernia He loses much positive health, many friends and perhaps the respect of his wife Psychologically, his whole outlook is unhappy because he realizes that the situation has arisen as a result of his own indecision

Treatment

Palliative measures

In certain, now well defined circumstances a truss is a valuable form of therapy In infants it is generally agreed that it is wise, when possible to postpone operation until the age of 1 year A properly fitted rubber truss correctly applied gives firm support and usually controls such a hernia If the hernia slips past whilst the child is crying there is usually little doubt that all is not well The mother must be warned of the possibility and must know how to remove the truss and to reduce the hernia before the truss is reapplied if in difficulty she must consult the doctor at once If the trouble recurs it is wise to proceed to operation at once which is then a relief to all concerned

Elastic webbing truss—The elastic webbing truss, with or without a pneumatic pad, of which a number of types are on the market and are widely advertised has certain advantages It is readily available, fitted at one attendance comfortable inexpensive and gives reasonable support to the small recently developed hernia, work is not interrupted In the long term view, however it has overriding dis advantages After perhaps 15 years by which time its owner has come to look on it with considerable misgivings it fails to control the hernia owing to atrophy of the underlying muscles After much heart searching the patient eventually seeks operation When seen for follow up later, his invariable lament is that he did not have the operation 15 years previously The truss, therefore served only to post pone and to make more hazardous the operation which would restore him to full health The indiscriminate supply of these trusses without proper medical advice cannot be too strongly condemned They have a small but useful place in the treatment of patients in whom operation is contraindicated for support whilst in bed—a spring truss being worn by day—and may sometimes be useful whilst a patient is awaiting operation

Spring truss—A spring truss simple or rat tailed for a larger hernia, is the firmest and most satisfactory form of external support Two visits to the truss maker are necessary for measurement and for fitting With due skill on his part most hernias are controlled Such a truss may be reasonably recommended in the following circumstances (1) as a temporary measure if operation has for any reason to be postponed as for instance to improve the patient s general

condition to allow pre operative dental or chest treatment or to avoid the winter months with their respiratory infections (2) as a permanent measure if operation is contraindicated

Sometimes a hernia is unaccountably not controlled or later becomes uncontrolled or the patient cannot tolerate a truss these are absolute indications for a change of policy Less obvious but none the less real to the patient is the fact that life with a truss requires the acceptance of limitations Activity is restricted interests change obesity may result and even personality may be affected The delight of a man who has worn a truss in his new *untrammelled freedom after a successful repair operation is good evidence*

Surgery

The aim of surgery is to restore the patient to full positive health Three months after operation he should be able to exert his full force without support fear or limitation

The reasons for surgery are to correct the present disability and to avoid future complications With these ends in view everything must be done to make him one hundred per cent fit before operation The mouth must be clean and dental sepsi eradicated chest conditions should be dealt with by a physician and *breathing exercises* supervised by a physiotherapist For patients with bronchitis winter with its acute respiratory *infections should be avoided as a time for operation* a truss may be *wisely prescribed* until spring If the patient has a cough, *smoking should* be stopped for 6 weeks before operation A friendly explanation that it is for his own benefit in order to avoid coughing after operation *is often sufficient* Advice from a convalescent patient *is most helpful* A tough line can be taken, that *operation will not* be undertaken unless smoking is stopped Better to lose a patient than to have a *recurrence*

All the muscles should be toned up by exercise obesity should be managed by a reducing diet and a weekly weight card Intertrigo or tineal infections of the groin should be treated by suitable measures in resistant cases bed rest may be necessary for a few days in order to separate the two skin surfaces and allow final healing Psoriasis can usually *be controlled* with the help of a dermatologist if it persists in spite of treatment *provided it is not secondarily infected* operation is undertaken through it fearlessly for healing proceeds normally For obvious reasons it is unwise to use non absorbable sutures under these circumstances

Contraindications to operation have been much reduced by thorough pre operative care and by *the skill of* the modern anaesthetist Age in itself, is no bar Many patients over the age of 90 *years have been* successfully operated upon Concomitant disease is a factor tending to contraindicate surgery but poor general health and chronic bronchitis *can often* be brought under *control* *Arteriosclerosis* and *particularly a* history of coronary thrombosis are relative contraindications but after successful treatment a *hernia may* be best dealt with surgically An enlarged prostate with obstruction *has prior claim* to treatment when convalescence is complete a hernia may then be dealt with *surgically* *A history* of thrombophlebitis *of the leg* is unfavourable but further trouble can be forestalled by the use of anticoagulant drugs

Anaesthesia has *entirely* altered the patient s outlook to surgery Fear has been largely removed by pre operative sedatives *and by* intravenous anaesthetics The post anaesthetic hang over has largely gone *it is* by no means *uncommon for* a patient to wake up and ask for his supper Vomiting still *occurs in a* number of

cases but is of short duration and yields rapidly to treatment Careful aspiration of secretions, rapid recovery of consciousness, immediate post operative breathing exercises and early ambulation have greatly helped to fight post operative chest conditions

Choice of operation —In the early years of life, straightforward careful excision of the sac gives excellent results In the presence of an undescended testis—best dealt with at an early age (*see* Chapter 14)—simple removal of the sac is again satisfactory

In school years treatment is similar unless there is a definite stretching of the internal ring In this case plastic procedures at the internal ring have proved un satisfactory, and it is wiser to repair the whole posterior wall of the canal by a Bassini repair

For the young adult, posterior repairs by the Bassini method or by a modifi cation of it have given satisfactory results In later years particularly where the tone of the muscles is poor or where they are becoming fatty, some reinforcement of the posterior repair is advisable A lattice repair, supporting the weak area by a darn reaching out into healthy tissues has given good results Nylon stainless steel or tantalum wire, silk, cotton and linen thread have all proved satisfactory Inplants of tantalum wire mesh or various forms of plastic material have their advocates

If any non absorbable materials are used a rigidly aseptic technique must be enforced To allow these materials to touch uncovered skin margins is courting disaster If infection occurs it was introduced at operation Stainless steel and nylon have been claimed to allow healing in the presence of infection without removal of the offending sutures but if a sinus occurs there is no alternative but to remove them The incidence of infection in careful hands is less than 2 per cent

Removal of the testis allows complete obliteration of the inguinal canal, as in the female, and renders the repair more certain The patient s prior consent must of course, be obtained Provided that the remaining testis is healthy, there are no ill effects for the patient other than perhaps an emotional one

Post operative care —This has seen more change than almost any other branch of surgery It starts as soon as the last suture is tied on the operating table All mucus is aspirated from the mouth throat and trachea and the patient is returned to the ward on his side with the foot of the trolley raised A sucker is at the bedside to allow further aspiration until he is conscious and active, normally within half an hour Active movements of legs arm and chest are started at once the wound being sealed with local coverings only there is no restriction by bandages Pillows are returned gradually so that in 4 hours he is half sitting up, moving freely, doing his breathing exercises and being encouraged to cough Pain is relieved by small repeated doses of pethidine or Omnopon which with due stimulation help him to cough more freely and to sleep Micturition is encouraged by sitting on the edge of the bed, or by standing beside it with assistance and he is encouraged to stand by himself either on the evening of operation or certainly by the following morning Thereafter he is allowed up freely and goes to the toilet on the second day

The dressing is not taken down until the eighth post operative day when the sutures are removed, and the patient is allowed home on the tenth day He is permitted to resume normal activity 4 weeks after operation but should not exert his full force until 3 months after operation when all restrictions are removed

Results of surgical treatment

Large series of cases have been reported showing recurrence rates as low as 0 8 per cent (Moloney 1958) In the earlier years of this decade recurrence rates up to 10 per cent were by no means unknown (May and Norman 1957) For direct hernias in advancing years figures of 10-15 per cent are representative (Telle 1957) A large proportion of these recurrences are however a bulge of the whole area not liable to strangulation and mostly symptom free The cardinal factors in the production of a recurrence are infection of the wound and post operative chest complications Both are largely preventable

If recurrence develops in the younger age group it should be treated surgically before the muscles have been stretched in the older age groups it is usually a bulge of the whole area and can be treated by external support

Complications are infrequent Swelling followed by atrophy of the testis is caused by too tight suturing at the internal ring the patient is not usually greatly inconvenienced Chest complications and retention of urine are the commonest troubles and it is to their prevention that pre operative and post operative care are directed Antibiotics are not used indiscriminately the sputum is examined for organisms and sensitivity before operation and checks are carried out post operatively If infection develops in the chest or elsewhere the correct antibiotic is then used in full dosage Coronary thrombosis has been recorded as causing a 1 per cent mortality in patients over the age of 60 years (Vaughn 1959) pulmonary embolism appears in any large series and occurs in about 1 in 300 cases in spite of all precautions but is not necessarily fatal

FEMORAL HERNIA

A femoral hernia is a protrusion of abdominal content into the thigh The common type passes through the femoral ring into the inner compartment of the femoral sheath Other types are surprisingly rare in view of the size of the aperture behind the inguinal ligament and the weight of the abdominal viscera it supports When the inguinal ligament is weak as perhaps may occur after repeated inguinal herniorraphies a hernia may form between the ligament and the femoral vessels This is a prevascular hernia which occurs also in cases of congenital dislocation of the hip when the iliopsoas muscle is greatly reduced in size (Narath s hernia) Hesselbach described a femoral hernia lying lateral to the femoral vessels Repair of these rarer hernias is notoriously difficult

Having passed the femoral canal the common hernia bulges forwards through the cribriform fascia Further descent into the thigh is prevented by the attachment of Scarpa s fascia to the deep fascia of the thigh A femoral hernia therefore not infrequently presents as a rounded swelling partly overlying the inner end of the inguinal ligament Its neck however lies below and lateral to the spine of the pubis whilst an indirect inguinal hernia with which it is most likely to be confused passes above and internal to the pubic spine The two can be differentiated by their methods of reduction A femoral hernia is reduced downwards into the thigh backwards through the saphenous opening and finally upwards into the abdomen A finger placed deeply under the inner end of the inguinal ligament prevents its reappearance An indirect inguinal hernia is reduced upwards and outwards towards the internal inguinal ring which lies half an inch above the midpoint of the ligament The pressure of one or two fingers here will control the hernia

Difficulty in diagnosis arises when the swelling is irreducible The differential

cases but is of short duration and yields rapidly to treatment Careful aspiration of secretions rapid recovery of consciousness, immediate post operative breathing exercises and early ambulation have greatly helped to fight post operative chest conditions

Choice of operation—In the early years of life straightforward careful excision of the sac gives excellent results In the presence of an undescended testis—best dealt with at an early age (*see* Chapter 14)—simple removal of the sac is again satisfactory

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The dressing is not taken down until the eighth post operative day when the sutures are removed and the patient is allowed home on the tenth day He is permitted to resume normal activity 4 weeks after operation but should not exert his full force until 3 months after operation when all restrictions are removed

Treatment

No form of external support plays any real part in the treatment of a femoral hernia A truss may support but never controls it Operation should be advised because of the risk of strangulation Even in a frail old lady the small risk of an elective procedure is infinitely preferable to the dangers of strangulation during a subsequent attack of bronchitis

The surgical approaches may be made (1) from the thigh which has the advantage of simplicity and of not disturbing the abdominal or inguinal muscles (2) from the groin which has the advantage of giving an excellent repair but the disadvantage of weakening the inguinal muscles with possible subsequent hernia formation or (3) from the abdomen which gives good exposure of both sides but requires an abdominal incision

In the uncomplicated case any of these approaches can give good results The simplest from the thigh would appear to have advantages Complications are few ambulation should be immediate and results are excellent

In cases of strangulation it is unwise to resect bowel below the inguinal ligament An inguinal approach is therefore sound though the lower approach with detachment of the inguinal ligament (Hey Groves) has its supporters In view of the possibilities of infection catgut is still favoured by many surgeons for the repair though nylon and stainless steel have been shown rarely to produce sinuses Recent series show mortality rates of 10·8 per cent (Jameson 1955) 13 per cent (Rogers 1959) and 40 per cent (Shabb and Bradford 1957) Koontz (1952) reported a mortality rate of 37 5 per cent when bowel resection was necessary Rogers of 26 per cent and Jameson of 6 3 per cent the last a very notable figure Wound infection was reported in up to 25 per cent of patients by Jameson All writers have pointed out the increasing mortality with delay for which patients and medical attendants would appear to be about equally responsible Shabb and Bradford (1957) reported tragic cases of missed diagnosis

Of the 170 patients with strangulation reported by Rogers (1959), 105 knew that they had a hernia previously an elective operation would therefore have prevented this painful and serious complication in 62 per cent

The recurrence rate for the original hernia is much increased after operation for strangulation as compared with elective procedures owing largely to the infection rate

INCISIONAL HERNIA

Incisional hernia or protrusion of abdominal content through the scar may follow any abdominal wound or incision It may follow dramatically as a burst abdomen or less obviously in a partial dehiscence which is probably commoner than is realized Alternatively it may develop insidiously over the course of years resulting from a gradual stretching of the scar Acting as a wedge driven progressively between the muscles of the abdominal wall by each cough and strain not unexpectedly it tends to progress steadily and may become disabling In the midline the rectus muscles may be separated to a handsbreadth or more and the hernia becoming pendulous hangs down in front of the pubis covered only by perilously thin skin through which peristalsis of the contained bowel is easily seen

With lateral incisions subsequent hernias tend to be smaller unless nerves to the abdominal muscles have been injured as with renal incisions The whole side of the abdomen may then weaken bulge and eventually give rise to grotesque deformity

diagnosis of an enlarged inguinal lymph node must then be considered but other nodes will almost certainly be palpable A saphena varix is soft and gives a thrill on coughing, a psoas abscess is fluctuant and its extension above is palpable In the doubtful case, such a swelling usually proves to be the fatty covering of a small femoral hernia Needless to say if there is a history of abdominal pain with *vomiting and such a swelling is tender, no attempt is made to reduce it for fear of* rupturing bowel gangrenous at a ring of constriction This is a strangulated hernia and urgent surgery is imperative

Complications

Strangulation

A femoral hernia is particularly liable to strangulation because of the fixity of its neck Moreover, Gimbernat s *ligament which forms the inner margin of the* neck is sharp and strong and the content of the sac may be acutely angled over it If only omentum is in the sac an abscess may form pus be discharged and all be well If only part of the circumference of the bowel is in the sac (a Richter s *hernia) an abscess may be followed by an intestinal fistula If a complete loop of* bowel is in the sac without active intervention intestinal obstruction or general peritonitis from rupture of the bowel is invariably fatal

In approximately half the cases of strangulated femoral hernia the patient is *aware of having had a lump at the site previously The strangulation itself is* caused by a sudden increase of intra abdominal pressure, as in coughing some times by a voluntary muscular effort as in reaching for a book or even by turning over in bed The patient feels a sudden pain in the groin with a sensation of *something being caught there followed by a sickening abdominal pain usually* with vomiting She probably takes to her bed where she is conscious of the lump in her groin but feeling better fails to send for medical advice Even with bowel in the sac the general upset at first may be remarkably slight The lump is usually *tender for the first few hours but as fluid collects in it its surfaces are separated* and tenderness may diminish and even disappear The writer has seen a strangu lated femoral hernia, the size of a large plum and containing gangrenous bowel which was completely painless and had not even attracted the patient s attention

If the lesion is not treated symptoms and signs of acute intestinal obstruction with vomiting abdominal distension and visible peristalsis develop Locally the contents of the sac become infected the overlying skin becomes inflamed and tender cellulitis develops around it and the general condition deteriorates rapidly *Death* ensues on the third or fourth day

The general signs are late in onset In the early stages—and this is when the diagnosis must be made—there is only the history and the local signs to go on The local signs are a tense tender lump over the hernial orifice which has no expansile impulse on coughing *If these signs are present the diagnosis is one of* strangulated hernia and the necessary steps for transfer of the patient should be undertaken forthwith

With a femoral hernia however recent the strangulation *no attempt at reduction is permissible* The margins of its neck are sharp and rigid and bowel has been ruptured by this means Another error is to attempt to differentiate degrees of strangulation (such as mild strangulation) Admittedly mild symptoms often indicate the presence of only omentum in the sac but this is by no means reliable, nor can *the nature of the content be reliably diagnosed by anything* less than operation Precious hours are often wasted by pursuing these fallacies

UMBILICAL HERNIA

Exomphalos

A congenital umbilical hernia or exomphalos represents a failure of part of the midgut to return to the abdomen from the extra-embryonic coelom The child is born with loops of small bowel protruding from the umbilicus and covered by a thin membrane In a few hours the distal part of the sac becomes gangrenous infection supervenes and the child dies from peritonitis The condition is of course obvious at birth The sac should be covered by a sterile dressing and surgical closure undertaken immediately Difficulty may be met in returning the bowel to the abdomen and tension may be unavoidable in closing the defect If it is im possible to close the defect is enlarged longitudinally in the midline to leave a wide neck and skin is mobilized and brought together over the bowel Many successes have been obtained

Infantile umbilical hernia

In infantile umbilical hernias the navel is closed by skin but a small finger like protrusion occurs into it when the child cries Treatment by strapping over a coin carefully applied and renewed only when necessary is almost invariably successful Even if still present after a year spontaneous healing will still usually occur If symptoms are caused or if the child s skin becomes sensitive to strapping opera tion should be undertaken and is carried out through a small half-circle incision within the umbilicus The scar is insignificant and under no circumstances is the umbilicus removed

Adult umbilical hernia

Umbilical hernia of adults whether truly into the umbilicus or through the linea alba immediately adjacent to it occurs in obese multiparous women Advice is often not sought until the hernia is enormous looking like a large cottage loaf balanced on the front of the abdomen Omentum and transverse colon are the chief contents but small intestine and stomach may enter at a later stage The overlying skin particularly in the fold beneath the hernia becomes inflamed and represents a serious hazard in surgical treatment Symptoms result from this inflammation as well as from obstruction to the passage of faeces in the contained colon leading to incarceration This is a dangerous complication owing to the likelihood of concomitant infection and vascular impairment in the sac content Many lives have been lost owing to time wasted in giving enemas in such cases whilst a drastic aperient may be fatal

If time permits the patient should be given a reducing diet and the skin cleaned by a daily bath and simple dusting powder A few days in bed before operation in order to separate the skin creases and to spray them with neomycin bacitracin powder is most effective Liquid paraffin by mouth and enemas may give great relief but operation must be undertaken to prevent complications Conservative measures with an abdominal belt only postpone the evil day

Elective operation with clean skin and the patient prepared has of course a risk as has any operation on such a patient but it is small and chances of cure are good The defect is repaired and reinforced Skin from the coverings of the sac has been extensively tried for this purpose but is too liable to infection Mono-filament nylon (Moloney 1958) has given good results

Two factors are responsible for the development of these hernias—weakness of the scar and increased abdominal tension Weakness of the scar may result from poor healing qualities as in debilitated, elderly, or cancerous patients from haematoma or infection of the wound from imperfect closure in tying sutures too tight causing necrosis of the tissues included in sutures cutting through, in not including the posterior rectus sheath in using too much heavy suture materials particularly catgut which results in excessive inflammatory exudate and possibly from reaction to catgut Increased abdominal tension is the result of a post operative cough In exhausting attempts to move a thick plug of mucus from the air passages every muscle is used If the smallest area of the wound gives way under this stress, a weakness develops which is exploited by each further effort and inexorably a hernia develops

Often the two factors co exist as after the closure of a perforated duodenal ulcer in a heavy smoker, an acute or chronic bronchitis causing explosive effort in coughing which even the strongest wound cannot withstand The importance of skilful anaesthesia in such cases at whatever time of day or night cannot be overestimated Poor relaxation on the table may result in tearing of sutures whilst the aspiration of secretions will exacerbate the chest condition This is without doubt the case for the experienced anaesthetist

As always, prevention is better than cure Everything possible is done before operation to make the patient fit, the sputum is sent for bacteriological examin ation so that organisms and their sensitivities are known Muscle splitting in cisions, owing to their valvular action are less liable to hernia than longitudinal incisions Drainage is established through a stab wound rather than through the main wound Breathing exercises are started immediately

If an abdominal wound is painful if discharge is more than expected and a partial dehiscence is suspected it is wise to take the patient back to the theatre and resuture the wound, rather than to watch a delayed convalescence with the development of an incisional hernia

A hernia through a grid iron incision results from wound infection after re moval of a perforated appendix Enlargement of the hernia is slow and an ab dominal support does not prevent it Bowel is adherent in the hernia and intestinal obstruction is not unlikely Surgical repair on the other hand is straightforward and gives good results

A hernia through a midline or paramedian incision presents a much more difficult problem Moreover it is a problem which is commonly shelved often to the patient s ultimate disadvantage by the prescription of an abdominal belt This gives good support and the patient is much relieved He soon finds that he cannot do without his belt however his muscles weaken his activity is limited and he finds himself condemned to wear the belt for life with possibilities of obstructive troubles later On the other hand a careful repair operation carried out early and under favourable conditions may avoid these troubles and restore the patient to all but the most strenuous pursuits After such an operation, a post operative cough is to be avoided at all costs the chest may well hold the key to success or failure

If a midline hernia develops therefore its treatment should be decided in con sultation as soon as it is diagnosed Obviously age general condition expectation of life, the presence of chest or urinary conditions and the outlook of the patient to operation are important factors

CHAPTER 19

INFECTIVE LUNG CONDITIONS

RONALD BELSEY

THERE are two conditions in which surgical treatment plays a major part in eradicating the intrathoracic infection—empyema and bronchiectasis In two others—lung abscess and pulmonary tuberculosis—surgery may ultimately be necessary when medical treatment has failed

EMPYEMA

Open drainage along traditional lines results in a long convalescence and ex penditure of much costly time and effort on the part of all concerned—patient medical staff and nursing staff Moreover permanent crippling of the chest due to deformity of the thoracic cage and pleural thickening is a common legacy The majority of empyemas can be prevented by efficient early treatment of the preceding pneumonitis Once pus has formed in the pleural cavity the problem becomes surgical In a very few patients mostly children an empyema may be cured by aspiration alone or in combination with chemotherapy To persevere with this treatment in an adult is futile and dangerous for though the pus may be sterilized by intrapleural antibiotics it cannot be eliminated Every day of delay in instituting definitive surgical treatment makes the surgeon s work more difficult and the prospect of a quick and full restoration of thoracic function more remote

In the acute phase of the disease once the presence of pus has been confirmed closed intercostal catheter drainage into an underwater seal should be instituted Partial re expansion of the lung will occur but the invariable presence of fibrin in the pleural cavity prevents complete healing After 2–3 days of drainage the patient s condition will have improved sufficiently to permit open thoracotomy under general anaesthesia The chest is opened widely the pus and fibrin evacu ated and a decortication performed The lung is first freed completely from the chest wall and mediastinum The layer of organizing fibrin is then stripped from the surface of the visceral pleura permitting re expansion of the lung It also allows examination of the underlying lung and frequently reveals a cortical lung abscess responsible for the empyema If small the abscess cavity and associated bronchopleural fistulae are obliterated by encircling sutures of stainless steel wire If the destruction of lung tissue is more extensive a lobectomy may be necessary but it is surprising to what extent healing can occur spontaneously The organizing fibrin may also be removed from the parietal pleura and diaphragm but this is not essential The chest is closed and catheter drainage maintained for a further 48 hours or until such time as re expansion of the lung is complete The appropri ate antibiotic is administered during the thoracotomy and for 3–4 days afterwards Provided re expansion of the lung is complete and the pleural cavity is obliterated the infection will not recur Unobliterated residual pockets may require open drainage but the empyema will have been considerably reduced in size by the decortication and the convalescence correspondingly shortened

SUMMARY

With present day pre operative care and anaesthesia, the indications for hernia surgery are wide, age limits have been largely removed and the results of operation are vastly improved Operation can be confidently recommended as a relief from the restrictions of a truss and from the fear of complications There is a small risk attached to any operation, or indeed to any period of bed rest for those of advancing years, the freedom and positive health to be gained are high prizes however, and, in a large majority of sufferers, the taking of that risk is well justified

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Clinical picture

Bronchiectasis commonly starts during childhood following an attack of measles or whooping cough Physical and mental development are retarded and chronic ill health with recurring bouts of acute bronchitis or even bronchopneumonia plagues the lives of both the parents and the child the latter spends much time away from school For the boy games become difficult owing to the coughing and expectoration initiated by any form of exercise For the adolescent girl the social embarrassment occasioned by the curiosity of her friends—she is usually thought to be suffering from tuberculosis—and the discovery of the halitosis about which even her best friends shrink from telling her may become acutely painful At one time the suicide rate amongst bronchiectatics was high the gas oven seeming preferable to life as a social outcast Some young adults are driven to consult their practitioners for the first time when their initial experiments in sexual intercourse result in distress and failure owing to the postural aggravation of their symptoms Later in life increasing dyspnoea adds to the disability Haemoptysis is common and frightening Chronic discomfort or even acute pain in the chest may result from pleural involvement by the infection

It is the severity of the symptoms and their interference with normal life rather than the risk of complications that compel the practitioner to seek a surgical consultation for his patient Inability to laugh or take moderate exercise without coughing up a mouthful of pus renders life barely tolerable Only surgery can cure the disease non operative measures can only mitigate the symptoms by temporary control of the secondary infection

Treatment

Treatment is considered under two headings—radical and palliative The aim of radical treatment is excision of all the diseased segments but only the diseased segments of lung tissue There is still considerable disagreement regarding the indications for surgical treatment In some centres less surgery than formerly is undertaken because of the disappointing results In other centres more and more cases are accepted for operation on the grounds that provided an intensive course of physiotherapy is given before and after operation the results fully justify surgical treatment The author supports the latter view Little will be achieved in prevention until such time as every child convalescing from measles or whooping cough undergoes radiography of the chest and then should any atelectasis be revealed receives a vigorous and possibly prolonged course of physiotherapy Unfortunately this will not be possible until a very considerable improvement in the available physiotherapy facilities has been achieved

Age is not a definite contraindication to surgery The younger limit depends more upon the mental development than the physical development of the child as soon as the child is old enough to co operate with the physiotherapists and nursing staff—usually about the age of 4–5 years—it is old enough for operation At the other end of the scale by the time the patient reaches the age of 60 years the secondary bronchitis will probably be irreversible and little will be gained by resecting the focus of infection However many patients between 50 and 60 years have been successfully treated for unilateral bronchiectasis

Planning the exact surgical procedure indicated in a particular instance is dependent upon the extent and distribution of the disease revealed by a bronchogram To attempt this investigation whilst the bronchial tree is choked with pus is futile A preliminary course of postural drainage and percussion therapy is

The longer catheter drainage is delayed the more difficult the subsequent decortication will become for technical reasons and the less complete the ultimate restoration of function Moreover delay in closed drainage increases the risk of rupture of the empyema back into the lungs, flooding of the bronchial tree with pus and a spreading pneumonitis Patients have been known to drown in their own pus following the sudden development of a bronchopleural fistula

When the empyema has become chronic, decortication may still be attempted and although more difficult may yet be successful The presence of a tuberculous infection is no contraindication to decortication indeed, provided the underlying lung infection is quiescent, it may prove to be the only way of avoiding a total thoracoplasty, with the inevitable loss of pulmonary function

Although the operation of decortication involves a major thoracotomy, the risk is small and the mortality rate low The risk is fully justified by the high proportion of satisfactory results assessed in terms of shortened convalescence and the speedy restoration of full thoracic function The worst that can happen is the persistence of a small residual empyema pocket necessitating open drainage but this complication only arises in about 10 per cent of the cases subjected to decortication Decortication is contraindicated, however, in young toxic children owing to the risk of cardiac arrest during thoracotomy, from acute toxic myocarditis In this group of cases the convalescence following open drainage of the empyema along traditional lines is far shorter than in an adult and there is less resulting disability provided that drainage is instituted early and efficiently maintained until obliteration of the pleural pocket is complete

BRONCHIECTASIS

Bronchiectasis is still a common distressing disabling and sadly neglected condition Even extensive tuberculous infection of the lungs can, and often does heal spontaneously, but bronchiectases never Once established, the pathological changes in the lung are irreversible and the resulting disability is progressive The localized focus of suppuration is always complicated by a generalized secondary bronchitis which may flare up at any time A spill over aspiration pneumonitis with acute abscess formation may occur in adjacent and previously normal lobes Empyema is a common complication A fortunate manifestation of the constant flux in the natural history of disease is that metastatic cerebral infections are not seen so commonly as in the past The reason is not clear unless it is the changing prevalences of bacteria If bronchiectasis spreads it does so not by a gradual process but as a result of sudden acute episodes—spill over, atelectasis, infection, and bronchial dilatation in the atelectatic segment

Bronchiectasis is still a killing disease but whereas formerly many young patients succumbed during acute exacerbations of the infection the advent of chemotherapy has enabled the inoperable patient to survive these acute attacks and exist in a state of semi invalidism and mounting disability Many of these patients quietly succumb in their early fifties to a combination of chronic infective toxaemia, pulmonary insufficiency and right heart failure

The disease is bilateral in one third of cases when first seen The distribution is segmental rather than lobar, but it is unusual for the diseased segments to be confined to one lobe The anterior segments of the lung are more commonly involved than the posterior segments and this fact accounts for the failure of much ill informed physiotherapy to control the infection and relieve the patient s symptoms

Pseudomonas pyocyanea Post operative complications have been few Occasionally a small residual empyema pocket may need drainage The routine use of an antibiotic cover has been abandoned and these drugs are given only on specific indications The importance of a prolonged post operative course of physiotherapy until the secondary bronchitis is controlled cannot be overstressed This treatment can be continued at home or at school and in the physiotherapy out patient department

The functional disability following resection for bronchiectasis is small as only functionless segments of lung tissue are excised There are many patients alive well and active with only two upper lobes following a bilateral resection One girl won the Victor Ludorum prize at her school sports within a year of undergoing such a procedure It is possible that after extensive resections in the very young true hypertrophy of the remaining lung tissue may occur but this is improbable in the adult

The long term results of surgical treatment depend upon the condition of the remaining lung tissue and the thoroughness with which the diseased segments have been excised The more normal the bronchographic appearances of the residual lobes the more complete the relief of the patient s symptoms When the resection has been partial or palliative the quantity of pus expectorated daily will be reduced but not eliminated The patient must be warned before operation that his symptoms will not be relieved immediately and that he may have to continue his postural drainage exercises for as long as 1 year after the operation before the full benefit will become apparent If this precaution is adopted much initial disappointment will be avoided The failure of treatment in the past has been due usually to incomplete resections based on inadequate bronchograms and insufficient physiotherapy before and after operation There is one type of case where surgical treatment is definitely contraindicated although most marked in the lower lobes the pathological changes are diffusely scattered throughout the entire bronchial tree and are associated with bilateral emphysema These changes are caused by a diffuse suppurative bronchitis secondary to a chronic upper respiratory infection rather than resulting from atelectasis and subsequent infection as in true bronchiectasis Pulmonary surgery has nothing to offer except disappointment in this condition

Non-operative treatment

When no surgical treatment is possible the patient is condemned to persevere with his postural drainage exercises *indefinitely* He may learn to sleep in the drainage position Most patients would willingly submit to a far more hazardous procedure than acquiesce in this regimen Chemotherapy may be of value to combat an acute flare up of the infection but cannot play any considerable part in the long term management of the infection Aerosol inhalations may improve the secondary bronchitis but cannot touch the chief focus of infection owing to the relative lack of air entry into the diseased segments

Conclusion

In conclusion then it may be reaffirmed that bronchiectasis is still a surgical disease that in view of the disability and misery for which it is responsible even extensive bilateral resections are justified provided facilities are available for prolonged courses of physiotherapy before and after operation and assuming that the patient has the intelligence and determination to co-operate in a long term approach to his problem

therefore carried out before the bronchography is performed After the diagnosis has been completed the physiotherapy is continued until no further reduction in the daily yield of sputum can be achieved A course of postural drainage at home prior to admission will shorten the time the patient has to spend in hospital It will be recalled that the anterior lung segments are more commonly involved than the posterior segments, therefore the ideal drainage position is achieved with the patient lying supine in the head low position, with the percussion therapy concentrated on the front of the chest If the patient's lungs are still too 'wet' after an adequate course of physiotherapy, this treatment is supplemented by a course of intrabronchial instillation of the appropriate antibiotic daily for a week, then every second day for a further 2 weeks The sputum may increase in quantity during the first week of this regimen but will become more mucoid and less purulent, during the ensuing 2 weeks the daily quantity will fall below the level achieved by physiotherapy alone The operation is planned to take place at the end of this period, when the maximum benefit will have been achieved, as a relapse will occur shortly after withdrawing the chemotherapy It is assumed that any gross sepsis in the mouth or upper respiratory tract will already have been dealt with

Radical surgery

A multi segmental resection is indicated by the distribution of the disease more often than a lobectomy The condemned bronchi are divided at the hilum of the lobe and the diseased segments are dissected out from the hilum toward the periphery Any resulting alveolar fistulae usually seal off within 24 hours of operation All normal segments of lung tissue are conserved in order to reduce to a minimum the resulting dead space and lessen the degree of compensatory emphysema that will subsequently develop and impair the function of the remaining segments A permanent diaphragmatic paralysis is often performed to assist the obliteration of the pleural space and discourage over distension The pleura is drained for 24–48 hours after operation by means of an intercostal catheter and underwater seal

Bilateral bronchiectasis presents a special problem When it is obvious that a second operation will be necessary the worst side is usually dealt with first Three months later the diseased segments are excised from the opposite side If doubt exists concerning the necessity for a second operation it is wise to wait at least 1 year before reaching any decision as the final result of the first operation cannot be assessed in less than that time

Palliative resection

When the disease is so extensive that no radical operation can be attempted, a palliative resection of only the atelectatic segments or lobes as recommended by Helm and Thompson (1958) is fully justified by the symptomatic improvement that may be anticipated

Results of surgical treatment

Thanks largely to the efficiency of the modern physiotherapist the mortality rate attending these operations is low In a personal series of 245 unilateral resections performed between 1953 and 1958 there were no deaths in 24 bilateral resections there was 1 death owing to a resistant post operative infection with

regimen owing to the tendency for the cavity to become lined with bronchial epithelium Open drainage is seldom enough when this has happened

Surgical treatment

The indications for surgery during the acute stage of the disease are the presence of sloughs of lung tissue in the abscess cavity and rupture into the pleural cavity with the formation of a pyo pneumothorax Open drainage of an abscess is per formed in two stages the object of the first stage being to obliterate the pleural cavity in the region of the abscess and reduce the risk of secondary empyema formation If the abscess cavity does not heal rapidly after open drainage a perm anent bronchocutaneous fistula may result and later require excision When the abscess is already chronic when first seen and in all probability partially or completely epithelialized drainage is contraindicated At this stage nothing short of a lobectomy will cure the patient and eliminate the risk of a recurrence of the infection

PULMONARY TUBERCULOSIS

Little will be said about this disease as its management is usually taken out of the hands of the general practitioner Fortunately most cases are now diagnosed early respond satisfactorily to sanatorium treatment and chemotherapy and but rarely require any surgical treatment As far as the community is concerned the chief problem remains the fit active carrier who continues to work with an open cavity and sputum containing live tubercle bacilli—often the type of patient who refuses investigation and treatment and is legally at liberty to do so The dramatic decline in the incidence of pulmonary tuberculosis does not justify neglect of the diagnosis and sputum examination for acid fast bacilli is an essential step in the investigation of every patient reporting symptoms referable to the chest

Temporary collapse therapy by means of pneumothorax phrenic nerve paraly sis or pneumoperitoneum has now been largely abandoned When the disease fails to respond to chemotherapy and g neral supportive measures either a lung resection—lobectomy or segmental resection—or rarely a thoracoplasty may be indicated After the operation the patient will return to the sanatorium for a further period of 3–6 months medical treatment and when eventually he returns to the care of his general practitioner routine follow up radiological examinations and sputum examinations will be necessary for some years to detect any tendency of the disease to relapse The decision regarding the appropriate time for the patient s return to work will be taken by his chest physician and practitioner in consultation

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LUNG ABSCESS

The incidence of lung abscess has fallen The main reason for this is the great improvement in the standard of oral hygiene amongst the general public and the lower incidence of dental sepsis It has been said that no edentulous patient ever developed a lung abscess More people can now afford to buy toothbrushes and have learnt the importance of using them Another contributory factor is the rising cost of alcohol intoxication, in the presence of pyorrhoea, frequently led to the inhalation of infected matter from the gums bronchial or bronchiolar obstruction infection of the atelectatic segment and finally suppuration Other causes of abscess formation are a *spill over pneumonitis complicating bronchi ectasis*, the inhalation of foreign bodies and malignant bronchial obstruction

The problem of pulmonary suppuration is of great concern to the anaesthetist No general anaesthetic for an elective surgical procedure should ever be given in the presence of dental sepsis There is ample opportunity following the decision to operate for the patient to receive the necessary dental toilet before his admis sion to hospital for the planned operation It is the responsibility of the surgeon to recommend this treatment, and of the anaesthetist to see that it has been carried out In the case of an acute surgical procedure emergency scaling of the teeth to remove all infected tartar and inspissated pus vigorous use of the toothbrush and an antiseptic mouthwash will go far to reduce the risk of a subsequent lung infection

Types of lung abscess

Lung abscesses can be classified into two types the putrid and the non putrid The less common, putrid abscess is accompanied by a foul smell to the breath, the expectoration of stinking pus and the presence of sloughing lung tissue in the abscess cavity In the non putrid abscess no sloughs are present and adequate drainage may be achieved through the bronchial tree with subsequent healing of the abscess A putrid lung abscess on the other hand calls for early surgical drainage and removal of the sloughs Two types of abscess complicate a bronchial carcinoma suppuration may occur in the atelectatic segment distal to an obstruct ing growth or a peripheral growth may itself break down and cavitate In both instances the expectoration of pus is less than would be expected in the case of a non malignant lung abscess of similar size Bronchoscopy is indicated in every instance to exclude the presence of a neoplasm or a foreign body before treatment is planned

The complications likely to develop in the neglected case are a spreading sup purative pneumonitis in other segments haemorrhage rupture of the abscess into the pleural cavity metastatic brain infections and a lapse into chronicity

Medical treatment

The principal method of treatment is prevention by eliminating dental sepsis and other foci of infection in the upper respiratory tract

The simple non putrid lung abscess will respond to intelligently applied postural drainage and percussion therapy combined with chemotherapy if commenced early Inspiratory breathing exercises are contraindicated as they may cause the abscess to increase in size owing to the presence of a ball valve obstruction at the site of the communication of the cavity with the bronchial tree

A considerable proportion of abscesses become chronic under this non operative

cent That serious delay in diagnosis exists as revealed by the low resection rate and the advanced state of the disease when first seen by a thoracic surgeon is equally self-evident Advances in anaesthesia surgical technique and pre operative and post operative care are offset by this delay

Bronchial carcinoma commences in the wall of a bronchus usually a major bronchus near the hilum of the lung but less commonly in a peripheral bronchus or bronchiole Most of the symptoms result from partial or complete bronchial obstruction with the inevitable infection that follows obstruction, their character and severity will depend upon the size and position of the bronchus obstructed It requires only a small growth to obstruct even one of the major bronchi Fortunately owing to the radiotranslucency of the surrounding lung tissue the growth itself or the resulting atelectasis quickly becomes apparent on radiological examination

RESPONSIBILITY FOR EARLY DIAGNOSIS AND TREATMENT

Delay in diagnosis can occur at any or every level As far as the patient is concerned nothing is more likely to encourage him to seek immediate advice than an increasing incidence of obviously successful treatment amongst his friends and acquaintances A careful appraisal of his symptoms by the practitioner and prompt arrangements for radiological and endoscopic examination will enhance his confidence It must be accepted nowadays that the man in the street reads in the lay press a great deal about disease and is aware of the diagnostic procedures and treatment called for A patient should never have to demand a radiological examination or change his practitioner in order to obtain one

TABLE

BRONCHIAL CARCINOMA SOUTH WEST REGION 1942-1957

Cases admitted to a surgical unit for further investigation	1239
Inoperable at bronchoscopy	625
Inoperable at thoracotomy	182
Resected	432

The general practitioner

Delay at practitioner level results usually from failure to appreciate the significance of the patient s initial complaints The earliest symptoms of lung cancer are a dry irritative cough pain or discomfort in the chest and increasing dyspnoea

Early symptoms

COUGH —The chief characteristic of the cough is its non productive nature In the patient already afflicted with chronic bronchitis he may notice a change in pattern of the cough and inability to obtain relief by clearing his bronchi of the mucus he habitually expectorates He may develop a wheeze which he can himself localize to one or other side of the chest and which again cannot be cleared by coughing The wheeze will sooner or later disappear quite suddenly This may be assumed to indicate an improvement in the patient s condition in fact it indicates that partial obstruction has become complete

CHEST PAIN —Pain in the chest of a pleuritic type results from the development of atelectasis and the ensuing infection Its localization depends upon the extent

CHAPTER 20

CANCER OF THE LUNG

RONALD BELSEY

CANCER of the lung is unique for three reasons first it is now the commonest malignant growth occurring in the male sex and kills more than 17,000 people every year, secondly one of the causes may be known, and thirdly the growth often causes symptoms sufficiently severe to take the patient to his doctor at a stage when it is confined to the lung, diagnosable, and curable

Bronchial carcinoma is a surgical disease curable by early diagnosis and early lung resection Early is the operative word Personal experience with some 2,000 cases of bronchial carcinoma and a careful survey of the case histories suggests that the average patient consults his practitioner within 6 weeks of the onset of his symptoms The general public especially that section addicted to cigarette smoking has been fully alerted by the lay press to the high incidence of this disease and its relationship to the consumption of tobacco The patient s first fear on coughing up a little blood or developing a pain in his chest is that he may have cancer, and the majority have the common sense to try to find out whether there is any foundation for their fears At the present time such is the power of propaganda the average patient is more surprised when, after complete investigation he is told he is not suffering from cancer, than when his fears are confirmed Thompson (1957) investigating delay in diagnosis in a metropolitan region, found that the average interval between the onset of symptoms and the first consultation with a general practitioner was 1 5 months

Delay in diagnosis

Thompson also found that of the overall delay of 7 4 months between the onset of symptoms and surgical treatment 5 9 months or 80 per cent occurred after the patient had consulted his practitioner Similar findings have emerged from other regions Review of the records of the Cancer Bureau for the South West region reveals that in 70 per cent of all cases symptoms have been present for 3 months or longer and in nearly 20 per cent for longer than 1 year Comparison of the figures for 1950 and 1955 reveals no evidence that the situation is improving

It is difficult to determine what percentage of all cases of lung cancer are referred to a surgical unit for consideration of resection Of those referred many cases will be deemed inoperable on clinical and radiological grounds alone In only 35 per cent of the cases actually admitted to the unit for further investigation is the growth found to be resectable (*see* Table)

It is fashionable to discuss the poor results of surgical treatment it is equally unfashionable to discuss the belated medical diagnosis in part responsible for the failures That the results of treatment are deplorable cannot be denied the overall 5 year survival rate in cases registered between 1945 and 1951 was 5 per

cent That serious delay in diagnosis exists as revealed by the low resection rate and the advanced state of the disease when first seen by a thoracic surgeon is equally self-evident Advances in anaesthesia surgical technique and pre operative and post operative care are offset by this delay

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CHEST PAIN — Pain in the chest of a pleuritic type results from the development of atelectasis and the ensuing infection Its localization depends upon the extent

of the collapse Pyrexia may be present After about 3 weeks the pain improves but is followed by a vague persisting discomfort "Bronchitis and pleurisy" is the popular diagnosis at this stage Bronchitis does not give rise to pleuritic pain unless complicated by pneumonitis Equally a diagnosis of pleurodynia evades the issue of determining the cause of pain The improvement in the severity of the pain, and in the pyrexia, often after a short course of antibiotic treatment engenders a false sense of security and complacency

DYSPNOEA —Dyspnoea is most marked when the growth is situated at or near the hilum of the lung It is probably reflex in origin, and not usually associated with either atelectasis or destruction of lung tissue but in an advanced case may indicate the occurrence of a pleural effusion

HAEMOPTYSIS —Haemoptysis may be absent until late in the disease Recent investigation of a personal series revealed that in only 30 per cent of proven cases of lung cancer had haemoptysis occurred up to the time of diagnosis Blood streaking of the sputum is of more significance than a frank haemorrhage which is more usually caused by dry bronchiectasis The absence of haemoptysis must never be assumed to eliminate the possibility of a growth

REACTION TO BRONCHIAL OBSTRUCTION —The inflammatory reaction to bronchial obstruction may be acute in onset and simulate pneumonia or "influenza If this occurs out of season , or is slow to resolve on the customary antibiotic treatment, the practitioner should immediately suspect an underlying growth and take the necessary steps to elucidate the situation In the past a diagnosis of the largely mythical condition of unresolved pneumonia almost invariably masked malignant bronchial obstruction Progressive weight loss and malaise are symptoms of advanced disease and are of small concern to those bearing responsibility for diagnosis at a curable stage

Radiography

Any one or any combination, of these symptoms is an absolute indication for prompt radiological examination Delay at this level may result from misinterpretation of minor changes in a hilar shadow One of the most urgent problems in the diagnosis of lung cancer is the assessment of the sometimes insignificant changes in the root shadow caused by a hilar growth but this is the growth most readily accessible to the bronchoscope Circumscribed peripheral shadows indicate, in practice either a peripheral type of bronchial carcinoma or a tuberculoma Only an exploratory thoracotomy can differentiate the two and is fully justified

Physical examination

Physical examination is of less importance than a careful appraisal of the patient s symptoms In only 10 per cent of patients are there any detectable physical signs at the time the diagnosis is confirmed

Summary

The responsibility of the general practitioner in early diagnosis may be summarized as follows

(1) Any symptom, even remotely suggestive of a growth is an absolute indication for prompt radiological examination

(2) A radiological report of atelectasis is an absolute indication for bronchoscopy

(3) Haemoptysis is an absolute indication for bronchoscopy even when the radiograph would appear to reveal no abnormality

(4) A radiological report of a peripheral lung mass is an indication for immediate reference of the patient to a thoracic surgeon for, in addition to bronchoscopy and tomography consideration of exploratory thoracotomy

In addition to the symptoms referable to the primary lesion in the chest other symptoms may indicate the presence of metastases in other organs Hoarseness indicates involvement of the recurrent laryngeal nerve by malignant infiltration to and beyond the subaortic lymph nodes Swelling and congestion of the head, neck and arms occurs when the superior vena cava is obstructed by growth either by a direct spread from the upper lobe of the right lung or following metastasis to the superior mediastinal lymph nodes Skeletal metastases to the lumbar spine or pelvi give rise to sciatica Fits headaches giddiness or changes in vision indicate the development of intracranial metastases Liver metastases are associ ated with anorexia nausea and abdominal discomfort or pain Involvement of th cervical lymph nodes is not infrequently noticed by the patient himself

When the general practitioner suspects the presence of a bronchial carcinoma he can refer the patient to a chest clinic or direct to a thoracic surgeon

The chest clinic

Delay in diagnosis at chest clinic level may result from several causes For many years past the investigation and treatment of chest disease has consisted chiefly of the management of pulmonary tuberculosis essentially a medical con dition in which the longer surgery was delayed the better The dramatically sudden change in emphasis to malignant disease of the lung—a rapidly progressive disease demanding immediate surgical excision—has been unaccompanied as yet by any corresponding change in attitude and alertne s on the part of the profession

Masterly inactivity no longer pays any dividends The natural bent of a physician is to attempt to cure disease without recourse to surgery except as a last resort A speculative course of streptomycin and other antibiotics may be given to eliminate the possibility of a tuberculous infection The inflammatory complications of malignant bronchial obstruction may improve temporarily under this regimen and encourage perseverance with the treatment The patient may be admitted to a sanatorium for a period of observation with the same object in view Pro longed radiological observation at monthly intervals of fascinating but pro gressive shadows in the lung field may delay diagnosis until the inevitable spread of the disease renders it quite obvious and treatment hopeless

The occasional discovery of tubercle bacilli in the sputum may cause confusion Both diseases may coexist but the tuberculous infection diverts attention from the bronchial carcinoma by far the more deadly lesion Sputum examination for cancer cells is unreliable and a negative report may lead to a false sense of security The examination of a pleural exudate for cancer cells is also fraught with difficulty and error

There are only two methods by which lung cancer can be diagnosed with cer tainty and with histological confirmation bronchoscopy and exploratory thorac otomy Bronchoscopies are performed in some chest clinics but the interpretation of the early endoscopic changes is more easily achieved by the surgeon who is in a position to correlate endoscopic appearances with the pathological changes revealed at thoracotomy The surgeon will have inevitably to repeat the bron choscopy as on his own observations will depend the decision whether or not to proceed with a thoracotomy Duplication of radiological and endoscopic investigations is time consuming

Only when bronchial carcinoma is treated by all concerned as an acute surgical emergency will the results of treatment improve The immediate problem is to accelerate the admission of the patient to a surgical unit where the diagnosis can be confirmed and resection carried out at the earliest possible moment

The thoracic surgeon

Indications for surgery

Assessment of the indications and contraindications for operation in any individual case is the responsibility of the surgeon The indications for resection are constantly widening as a result of progress in anaesthesia and surgical technique Formerly, it was considered that no patient over the age of 70 years would tolerate a resection This view is no longer tenable as many successful resections have been performed in patients aged between 70 and 80 years No longer is obstruction of the superior vena cava an absolute contraindication to operation If the obstruction is due to a direct spread from the lung rather than lymphatic metastases resection and replacement of the vein by a graft may be possible Neither paralysis of the phrenic nor the recurrent laryngeal nerves necessarily indicates a hopeless situation in the absence of other evidence of spread to the mediastinum The previously accepted criteria of a patient s ability or inability to withstand any major surgical procedure for example abnormal electrocardiographic changes have now been largely abandoned In fact the only reliable test is to operate and find out, a somewhat empirical approach fully justified by the inevitably fatal outcome without surgical treatment A lymphocytic pleural effusion indicates infection secondary to bronchial obstruction, not a spread of growth to the pleura and successful resection may still be possible The direct spread of a peripheral growth to the chest wall can frequently be defeated by a block resection of the chest wall and reconstruction of the thoracic cage by a prosthesis of stainless steel wire mesh

Pulmonary function tests have proved disappointing as a practical guide to the patient s cardiopulmonary reserve and probable extent of the post operative disability The assessment of the degree of contralateral pulmonary emphysema from radiological appearances is equally inaccurate The diseased lung may already be partially or completely destroyed and its removal may in fact impair not at all the patient s exercise tolerance which is probably the best practical test of his ability to withstand the resection

Contraindications to resection

The contraindications to resection are incontrovertible evidence of metastasis to other organs such as the liver the skeleton or the central nervous system a bloodstained pleural effusion direct spread of an apical growth to the brachial plexus and bronchoscopic evidence of mediastinal involvement Dyspnoea at rest or on slight exertion generally excludes any hope of a worth while result

Type of operation

Exploratory thoracotomy is the final court of appeal in many cases and may be the sole method of confirming the diagnosis assessing the extent of the disease and selecting the most suitable type of operation This procedure is always justified as the risks complications and resulting disability are negligible if resection is found to be unnecessary The operation of choice is the most limited resection compatible with complete extirpation of the growth and its local extensions

When the growth is situated at the hilum a total pneumonectomy is almost invariably indicated All enlarged hilar and mediastinal lymph nodes are resected along with the lung but in many instances the enlargement is due to the secondary infection in the lung and not metastasis A routine block dissection of all accessible mediastinal lymphatic tissue along with removal of the lung—the so called radical pneumonectomy—is not justified on the evidence available at present

For the peripheral type of growth the results of lobectomy are as good as or even better than those of total pneumonectomy and the resulting disability is correspondingly less When the exploratory operation reveals a pathological lesion the nature of which is not immediately obvious on inspection and palpation a local resection is carried out and the specimen sent immediately to the pathologist for frozen section or quick smear examination If the lesion proves to be malignant then the more radical procedure can be completed forthwith as indicated by the probable extent of the lesion revealed by this preliminary examination

Recent technical developments that have added both to the safety and efficacy of lung resection are first the intrapericardial ligation of the pulmonary vessels and when necessary partial resection of the left atrial wall secondly, high bronchial resection and closure of the bronchial stump by stainless steel wire sutures and thirdly meticulous attention to maintenance of the pre operative position of the mediastinum in the immediate post operative period and avoidance of the intrapleural pressure changes that may lead to acute cardiac failure

PROGNOSIS

The operative mortality rate following lung resection even when carried out in the presence of advanced and complicated disease is in the region of 8 per cent The commoner causes of death are contralateral lung infection, acute pulmonary insufficiency and acute vascular catastrophies such as peripheral failure pulmonary embolism or cerebral thrombosis Bronchial fistulas and pleural infections are far less common than formerly Compensatory emphysema of the remaining lung is less incapacitating when it is allowed to develop only slowly by maintaining the pneumothorax on the operated side with air refills However the concensus of opinion is that a thoracoplasty to prevent permanently any mediastinal shift is neither justified nor necessary The principal late causes of post operative death are acute right heart failure due to the diminished pulmonary vascular bed acute intercurrent infections of the remaining lung and a recurrence of the growth

The rapidity of convalescence following resection is directly proportional to the patient s determination to return to his former employment and diversions

Following a total pneumonectomy the patient s capacity for exercise is reduced to about 70 per cent of its normal level following lobectomy the disability is even less The patient should be able to return within 3 months to his previous work and hobbies to play golf and tennis to swim shoot fish tend his garden cycle and hunt as well as staring at the television screen By far the most important feature of the post operative care is a prolonged course of intelligently applied physiotherapy to maintain the maximum function and efficiency of the remaining lung tissue and discourage excessive compensatory emphysema. Needless to say the patient should be strongly urged to give up smoking for ever more A reduction in the patient s weight will be beneficial Vigorous efforts should be made to prevent any threatened infection in the remaining lung by the administration of the appropriate antibiotic from the outset Sudden increase in the dyspnoea denotes an impending attack of right heart failure and calls for a short period of rest

The overall 5 year cure rate for lung cancer is approximately 5 per cent. This lamentable figure is due largely to late diagnosis and the advanced state of the disease when first seen, if ever by the thoracic surgeon On the other hand in the group of cases where resection is possible, even in the presence of a spread to the mediastinal lymphatics and the patient survives operation 32 per cent are alive and well 5 years later This figure is better than the corresponding figures for bladder (31 per cent) bones (28 per cent), larynx (23 per cent) stomach (21 per cent), kidney (20 per cent), and prostate gland (15 per cent) In short when the patient returns to the care of his practitioner, having had a lung resection he stands a 1 in 3 chance of being alive and well 5 years later When the growth still remains confined to the lung at the time of resection, the 5 year survival figure may rise to 60 per cent (Thompson 1957)

MANAGEMENT OF INOPERABLE GROWTHS

When the growth is deemed inoperable on bronchoscopic radiological, or clinical grounds the patient s life may be rendered more comfortable by certain palliative measures

Radiotherapy

Deep x ray therapy plays an important part in palliation and the following are definite indications for its use

(1) Early or otherwise operable growths where surgery is contraindicated by the patient s general condition

(2) Threatened or recent obstruction of the superior vena cava in cases where it seems improbable that a resection can be performed

(3) To relieve pain caused by a direct spread of the growth to the chest wall or brachial plexus

(4) To maintain patency of the bronchial lumen, and so delay the onset of secondary infection when obstruction is threatened and the growth is inoperable

(5) When on psychological grounds it is important that some form of treatment be given as in the case when the patient is himself a medical practitioner

Deep x ray therapy if given in doses sufficiently large to affect the growth generally causes some degree of pulmonary fibrosis and an increase in the dyspnoea It is contraindicated by the presence of gross pulmonary suppuration The pain of skeletal metastases may be relieved temporarily by x ray therapy

Surgical measures

Pyrexia and toxaemia resulting from suppuration secondary to bronchial obstruction can generally be relieved and the patient s condition greatly improved simply by clearing the bronchial lumen with biopsy forceps through the bronchoscope followed by a course of postural drainage and percussion therapy The palliative resection of a lobe or lung in the presence of an otherwise inoperable growth in order to eliminate a focus of infection and toxaemia may be worth while in a few cases

CONCLUSION

The problem of lung cancer in its wider aspects involves the medical profession in certain philosophical problems Assuming that the overwhelming evidence pointing to a direct relationship between cigarette smoking and lung cancer is accepted, should the profession press for the abolition of the cigarette? Is it their

duty to do so or merely to warn the public in no uncertain terms of the consequences of their indulgence? At what stage does preventive medicine become a mockery when the State gleans £700 000 000 a year from taxation on the sale of a commodity known to be at least partially responsible for a disease that kills 17 000 people every year?

Should the patient suffering from lung cancer be told of his plight? If the diagnosis has been proven beyond any shadow of doubt then frankness on the part of the practitioner will encourage the confidence of the patient The patient who discovers too late that he has been misled regarding the seriousness of the position becomes increasingly difficult to help in the terminal stages Many patients will accept the information more readily after a resection of the growth has been carried out The conception of lung cancer as a disease so frightful and hopeless that even the doctor dare not mention it is calculated to increase the patient s anxiety and despair If on the other hand no positive histological report on a biopsy specimen has been obtained then it may comfort the patient to learn that the clinical diagnosis might be mistaken The profession on the whole tends to underestimate the fortitude of the average patient and his ability to accept the inevitable Acceptance comes more readily when the patient is convinced that no opportunity for early diagnosis has been missed and no effort spared to help him

REFERENCE

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CHAPTER 21

HEART DISEASE

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INTRODUCTION

MODERN cardiac surgery dates back to 1939 when Gross described the first successful ligation of a patent ductus arteriosus Before this time there had been many attempts to treat certain well recognized cardiac conditions by surgical means but the only operations to find a permanent place in the surgical programme had been partial pericardectomy for constrictive pericarditis and drainage of a pyopericardium During the 1920s Graham Cutler and Souttar, were all interested in the surgical treatment of mitral stenosis but although some success was achieved the treatment was not put on a permanent footing In retrospect this was probably due to factors other than surgical technique such as ill adapted anaesthesia lack of blood transfusion facilities and the absence of antibiotics

Crafoord and Nylin (1945) and Gross and Hufnagel (1945) reported the successful resection of aortic coarctation and during the same year Blalock and Taussig (1945) made their important contribution on the treatment of Fallot s tetralogy by pulmonary systemic arterial anastomosis an operation which now bears Blalock s name This work perhaps more than any other served to stimulate interest and effort in the surgical treatment of cardiac abnormalities

Widespread application of anastomotic procedures (Blalock s operation Potts operation) for cyanotic heart disease was followed in 1948 by successful attacks on mitral stenosis in which Harken Bailey and Brock were pioneers These were followed by attempts to relieve obstruction in the aortic and pulmonary valves

Concurrent with the tremendous strides made in surgery there was an equally dramatic development of diagnostic methods and investigations which brought with it a better understanding of the anatomical variations and physiological disturbances produced by both congenital and acquired lesions Much information was obtained about the conditions inside the heart by cardiac catheterization angiocardiography and more recently by indicator dye dilution technique

Cardiac catheterization enables the pressure and oxygen saturations in the right side of the heart to be determined Similar readings on the left side have been obtained by direct puncture of the left atrium and the left ventricle either through the bronchoscope or directly through the chest wall

Angiocardiography performed usually by the venous route has likewise been extended by aortography carried out with a catheter inserted via a peripheral artery into the aorta In both these instances details about the left side of the heart which were not available by the more orthodox methods were obtained

Up to 1952 all surgery on the heart was by the means of closed or blind techniques However open cardiac surgery particularly in a bloodless motionless field was the ultimate aim and during the years which have followed a great deal of thought and work has gone into the preparation of two methods by which these aims could be achieved Both methods are designed to protect the brain against the inevitable damage that results when the heart is excluded from the circulation Controlled lowering of the body temperature (hypothermia) reduces the metabolic requirements of the brain and permits exclusion of the heart safely for 8 or 10 minutes The brain may also be protected by setting up an extra corporeal circulation to replace the normal function of the heart and lungs during the period of cardiac exclusion This technique though considerably more complicated allows a longer period for work upon the heart and there is no actual time limit though operations in excess of 1 hour are uncommon

Hypothermia

Credit for the development of hypothermia must largely go to Bigelow of Toronto (Bigelow Lindsay and Greenwood 1950) whilst the method was pioneered clinically by Swan in the United States of America (Swan and his colleagues 1953)

The technique of hypothermia involves cooling of the entire body either directly by immersion in ice-cold water or indirectly by circulating blood from one large vein to another via a cooling coil The body temperature is reduced from 37 to 30 C Generally speaking total body cooling by immersion and ice packs takes longer to achieve the given reduction in temperature but is perhaps a little safer than direct blood cooling It has the disadvantage that cooling has to commence before the chest is opened and therefore before the determination of operability is made On the other hand it requires little special apparatus and once the timing is mastered is a relatively controllable technique The time available is sufficient to enable fairly simple procedures to be carried out on the empty but beating heart In this way atrial septal defects have been completely repaired and pulmonary and aortic valve stenosis successfully treated

Extracorporeal circulation

Complicated lesions such as ventricular septal defect and Fallot s tetralogy could not be treated under hypothermia and these have required the development of artificial heart lung machines To provide a satisfactory mechanical substitute for the heart it is necessary also to provide a substitute for the lungs for although many attempts have been made to utilize the patient s own lungs for oxygenation it is technically not practical to do so It therefore follows that any extracorporeal apparatus must embody both a pump and an oxygenator

There are many varieties of pumps available most of which depend upon the mechanical compression of plastic tubing Oxygenators vary greatly in design but most of those currently in use depend upon the exposure of blood to gaseous oxygen

In order that oxygenation shall be complete the blood must be exposed to the oxygen in the form of a very thin film Such a film may be formed by allowing blood to stream down a vertical fixed wire mesh screen (Gibbon 1954) or by revolving metal or plastic discs in a trough of blood in such a way that a film is picked up and continuously renewed by the discs (Bjork, 1948 Melrose 1953) Alternatively oxygen may be actually bubbled through the blood the bubbles

so formed constituting the film (DeWall and his colleagues 1957) The last named method depends for its efficiency and safety on subsequent 'debubbling' of the foam so formed and makes use of the defoaming properties of silicone There are many variants on each of the above methods but the same general principles are made use of in all Attempts to oxygenate blood by a more physiological process of diffusion through a membrane are not yet wholly successful owing to the very large areas of membrane required and the practical difficulties of securing adequate diffusion of gases without sequestrating large volumes of blood outside the body It is with this type of oxygenator that removal of carbon dioxide becomes a serious problem

These practical difficulties are being overcome and there is little doubt that the membrane oxygenator will become *increasingly important in the future* For the present however the rather cumbersome but very effective devices at present available continue to yield extremely valuable results

With increasing experience however, more and more stress is being laid on the team of workers involved in such procedures rather than in differences between various types of apparatus All the *existing systems* have, in common, drainage of blood from the patient from superior and inferior venae cavae by plastic tubes led out of the patient through the right atrium This blood then enters the oxygen ator and when oxygenated is pumped back into the arterial system of the patient through a cannula inserted into a peripheral artery, usually the subclavian or the common femoral Steps are taken to control the relative quantities of blood *in patient and machine and continuously to monitor central arterial* and venous pressures in the patient Further evidence of the efficacy of the perfusion is afforded by continuous observation of the electroencephalogram In this way the patient is maintained in a relatively normal physiological state

A valuable adjunct to extracorporeal circulation is the technique of *potassium* induced cardiac arrest which was introduced by Melrose and his colleagues in 1955 This provides a completely still heart for the surgeon to work on Full details of the method are given in a paper by Gerbode and Melrose (1958)

MITRAL STENOSIS

The use of surgery in the relief of mitral stenosis must be based on a clear understanding of the natural history of the disease and of the pathology of the damaged valve and myocardium In many patients with rheumatic valve disease no clear cut history of rheumatic fever is obtained In others there is usually a latent period of many years before symptoms of mitral stenosis become *manifest It is probable that the mitral valve is affected by the rheumatic* process at the time of the original infection, and that during the subsequent years there is a gradual fibrosis and narrowing of the valve eventually producing the signs and symptoms of critical mitral stenosis

With the appearance of symptoms the disability tends to be slowly progressive although there may be periods of acceleration associated with such episodes as pregnancy the onset of auricular fibrillation or the occurrence of a systemic embolus The average time from the first appearance of symptoms to complete disability is about 7 years This sequence of events influences the timing of surgery very considerably It is obviously unwise to operate because the patient has signs of mitral stenosis if the symptoms are slight and non progressive Equally it is foolish to wait until symptoms are severe enough to suggest a failing myocardium as at this stage relief of the mechanical obstruction is unlikely to be followed by

recuperation of the ventricle The ideal time for surgery lies between these two extremes at a point where the symptoms are moderately disabling and slowly progressive

Pathology

The pathological changes in the valve have a considerable bearing upon the efficacy of mitral valvotomy they do not affect the indications for valvotomy quite as much For convenience they can be divided into several groups as follows

(1) Fusion of the commissures with slightly thickened edges to the cusps but with the valves otherwise relatively normal and mobile and with normal attachments of the chordae tendinae This is the most favourable type as the separation of the fused commissures will produce a valve which is nearly normal

(2) In the next stage the cusps are more widely involved and much of the normal structure especially the posterior or mural cusp is replaced by fibrous tissue The valve thus becomes rigid shrivelled and immobile A reasonable valvotomy can be expected but the contraction of the valve will prevent full restoration of function and the risks of producing incompetence are increased

(3) In the next stage there is further extensive fibrosis and with it calcification in the cusps and adjacent valve ring These valves are not only stenosed but usually incompetent as well The whole structure is fixed and rigid and valvotomy can do little more than make a small rigid hole somewhat larger There is always the risk of increasing the incompetence which is already present and an appreciable risk of dislodging a small fragment of calcified material which may produce systemic embolism in the cerebral or peripheral vessels As one progresses from the simplest form of involvement to the more severe one finds that there is a progressive loss of mobility of the valve parts together with the development of calcification and possibly of incompetence

From the point of view of assessing the probability of a successful valvotomy it is thus obvious that these three aspects (valve mobility calcification and incompetence) must be carefully considered

Clinical features

Symptoms

Once symptoms start patients with mitral stenosis run a progressively downward course Many of these symptoms show a slowly increasing severity but the downward trend is often hastened by certain complicating factors In younger women pregnancy will often bring out symptoms which were not present before and in those who alr ady have symptoms pregnancy will often aggravate them these are sometimes of sufficient severity to justify surgical treatment during the pregnancy but patients with less severe symptoms may successfully conclude their pregnancy though subsequently somewhat worse off than before Later pregnancies will usually have a similar effect in hastening the downward course of the disease It is often surprising how much additional trouble patients develop during the first 2 to 3 months of pregnancy and this is thought to be due to the increase of blood volume which occurs early in pregnancy

Atrial fibrillation is anoth r potent cause of precipitating symptoms In a number of patients the development of atrial fibrillation accounts for the first awareness of trouble and in many the diagnosis is only made at this stage In others fibrillation may precipitate an attack of failure but even after the fibrillation is satisfactorily controlled and the failure treated the patient is usually

worse off than before With fibrillation is associated the possibility of systemic embolism There is no doubt that the fibrillating atrium is more prone to clot development in either the appendage or the atrium proper but there are well documented cases of clot forming in the presence of sinus rhythm and of systemic embolism occurring under similar circumstances It is possible however that some of these were caused by paroxysmal atrial fibrillation

It is estimated that approximately 20 per cent of patients with mitral stenosis have emboli at some stage or other and of these approximately half are cerebral whilst the remainder are distributed throughout the body with particular preference for femoral popliteal and brachial arteries The most serious are the cerebral as quite a proportion of the patients who survive the incident are left with permanent and often considerable disability There seems little doubt that the occurrence of one embolus is likely to be followed by another and each further embolus makes a subsequent one more likely

Age also plays an important part in determining the effects of valvotomy for several reasons In the first place the incidence of systemic hypertension and myocardial degeneration rise with age and a patient in the sixth decade may have a damaged myocardium from one or other of these causes in addition to the mitral stenosis The mitral valve may be pathologically suitable for valvotomy but the myocardium may be unable subsequently to adjust to the altered conditions Age also affects the valve itself Tough fibrotic and calcified valves are more common amongst the elderly than amongst the youthful and the chances of a good valvotomy are reduced The elderly tend to be less resilient and less able to cope with the inevitable physiological and psychological problems consequent on major thoracic surgery This does not mean that patients over the age of 50 years are unsuitable for mitral valvotomy but it does mean that the pros and cons of surgical treatment must be more carefully weighed in people in this age group

Physical signs

The physical signs of importance to the clinician assessing a patient for valvotomy can be considered under three headings

SIGNS OF MITRAL OBSTRUCTION —Mitral stenosis obstructs the forward flow of blood so that cardiac output is reduced the pulse relatively small and the peripheral circulation poor Behind the obstruction there is evidence of engorgement The left atrium becomes enlarged and the pulmonary vessels overfilled The right ventricle becomes hypertrophied and active in an attempt to overcome the obstruction As time goes on secondary arteriosclerotic changes occur in the pulmonary vessels which result in decreased congestion and a marked increase in the resistance to the forward flow of blood producing still further strain on the right ventricle

Signs of critical mitral obstruction can be summarized as follows

In the valve itself there is an accentuation of the first heart sound in the mitral area together with a presystolic and a diastolic murmur possibly accompanied by a thrill A high pitched reduplication of the second sound just inside the apex beat, known as an opening snap is produced by the sudden opening of the valves due to the raised intra atrial pressure The right ventricular contraction is accentuated and can be readily felt and often seen Radiologically, the main pulmonary arteries are considerably enlarged, the peripheral branches becoming progressively smaller and less obvious however as pulmonary hypertension

develops In the left oblique view the enlargement of the left atrium can be readily seen Electrocardiographically there is evidence of right ventricular hypertrophy

SIGNS INDICATING THE PATHOLOGY OF THE VALVE—A mobile mitral valve gives rise to marked accentuation of the first heart sound and a well developed opening snap conversely a rigid or calcified valve results in the production of a normal or weak first sound and the opening snap is often absent Calcification of the valve can usually be made out by fluoroscopy or by oblique tomographs designed to show the mitral valve area

SIGNS OF OTHER VALVE LESIONS WHICH MAY BE RESPONSIBLE FOR SOME OR ALL OF THE SYMPTOMS—The most important lesions which have to be considered here are aortic stenosis aortic incompetence and mitral incompetence The murmurs associated with aortic stenosis and incompetence will be considered later The most constant sign of mitral incompetence is a loud blowing systolic murmur at the apex conducted into the axilla The incompetent valve is usually a rigid valve so that signs of mobility are often absent The most important sign of these three lesions however is left ventricular enlargement Any evidence of this either clinically radiologically or electrocardiographically in association with signs suggesting one or other of the above lesions should make one suspect that the associated mitral stenosis is not the whole cause of the symptoms However accurate assessment of these complex cases is extraordinarily difficult and in many instances careful physiological studies by cardiac catheterization and so forth may be necessary to solve the problem Even with all the advantages of such investigations however it may be impossible to be certain about the true state of affairs and in these circumstances it is often advisable after careful considera tion to recommend a thoracotomy with digital exploration of the mitral valve

Indications for operation

The indications for mitral valvotomy can be stated fairly precisely Operation is advised for those patients with signs of severe mitral obstruction who have symptoms referable to such obstruction (for example exertional dyspnoea attacks of paroxysmal dyspnoea bronchitis and embolism) and in whom there are no other valve lesions that might be responsible for the symptoms

The best results are obtained in patients who have signs of a mobile valve and no clinical or radiological evidence of valve calcification who have a small heart have not had right sided heart failure and have no raised pulmonary vascular resistance

Contraindications to operation

There are relatively few absolute contraindications to mitral valvotomy in those patients whose symptoms are severe enough to justify operation and in whom the cardiac condition has not reached the stage of severe decompensation with right heart failure

Active carditis

Active carditis constitutes an absolute though possibly temporary contra indication to valvotomy as operation at this stage may have unfortunate consequences

Right heart failure

A patient with uncontrollable right heart failure is unlikely to survive mitral valvotomy or other major surgical procedures The position is different if, with

treatment the heart failure can be controlled, in such patients although the risks still remain somewhat higher there are reasonable prospects of survival with good results Moreover their future is so indifferent without surgical treatment that the extra risk is justified

Age

There has been some reluctance to advise mitral valvotomy in the adolescent or young adult owing to the risks of further attacks of rheumatic carditis with the production again of mitral obstruction However if severe mitral stenosis is present it is perfectly justifiable to carry out a valvotomy even in a very young individual

After the age of 50 years assessment must be carried out with care owing to the greater incidence of myocardial degenerative disease and hypertension Many successful valvotomies are performed even in patients over the age of 60 years but the selection is much more critical than in younger individuals

Atrial fibrillation

Patients with atrial fibrillation carry a slightly higher risk than those in normal rhythm partly because fibrillation on the whole implies more advanced involvement of the myocardium but, in addition, it greatly increases the possibilities of clot formation and so increases the risks of embolism either before or during the operation This does not mean that such cases are excluded from operative treatment in fact, 75 per cent of all patients subjected to operation are already fibrillating

Operative risks

The operative risks will obviously depend upon the selection of patients for mitral valvotomy The average is in the region of 5 per cent Deaths actually at the time of the operation from ventricular fibrillation or uncontrollable haemorrhage are relatively few The main risks are in the early post operative period and are from the effects of systemic embolism, from overwhelming bronchopulmonary infection or from the effects of severe mitral insufficiency produced at operation These complications are to a certain extent unpredictable and although every care is taken to avoid them it is never possible to eliminate them altogether

Mitral regurgitation can, to a certain extent, be avoided if care is taken during the valvotomy not to split beyond the commissures but occasionally in spite of all precautions, severe incompetence is produced

Systemic embolism is almost always produced at the time of operation and there are relatively few instances of embolism occurring during the post operative period The danger derives from the dislodging of soft red fresh clot from the atrium and the pre operative employment of anticoagulants in all patients with atrial fibrillation has resulted in a significant fall in operative systemic embolism If clot is encountered in the atrium or if the mitral valve is heavily calcified fragments of clot or calcium which may be dislodged by the operative procedure may be prevented from reaching the cerebral vessels by temporarily occluding the three main branches of the aorta by clamps or tapes during the intracardiac manipulations If an embolus is dislodged it will pass to one of the peripheral vessels where it can if necessary, be removed by arterial embolectomy

Bronchopulmonary sepsis is an occasional unfortunate and serious complication of all forms of surgery in hospitals at the present time The offending organism

s often a multiresistant staphylococcus and the routine use of an antibiotic cover for the operation does not appear to have had any appreciable effect upon the incidence of this complication Moreover when it does occur antibiotics are often ineffective

Results of operation

The results of mitral valvotomy are good 75 per cent of patients achieve excellent or good results Those with minimal or moderate symptoms may be rendered almost symptom free but those in the later stages of the disease with severe symptoms can only be moderately benefited and returned to a stage of slight to moderate incapacity

The factors influencing the quality of the result have already been considered these are calcification or rigidity of the valve atrial fibrillation the association of other valve diseases—particularly aortic stenosis aortic incompetence mitral incompetence and tricuspid valve disease All these reduce the benefits to be expected from the operation The greatest cause of poor or bad results is mitral incompetence produced by the operation This occurs to some degree in 15–20 per cent of all patients but in the majority it is slight and does not produce any haemodynamic changes the only evidence of its presence being an apical systolic murmur not previously present In these patients with slight incompetence the results of the operation are still excellent from the subjective point of view In about 5–10 per cent of patients moderate or severe incompetence is produced of sufficient degree to cause cardiac enlargement and symptoms similar in many ways to those of the pre existing mitral stenosis In only relatively few is it severe enough to produce progressive heart failure and early demise

Although the improvement in both subjective and objective signs wrought by successful operation tends to persist over many years there are a proportion of patients who some years after a successful valvotomy develop signs of fresh obstruction In the vast majority this re stenosis follows an inadequate first operation In many instances particularly when the operation was performed by the relatively inexperienced the commissures of the valves were not effectively split and perhaps little more than a good dilatation of the valve was achieved It is perhaps surprising that under these circumstances the results are as good as they are but likewise it is not surprising that sooner or later signs of obstruction reappear

When a second operation has been carried out the condition of the valve has often been found identical with that discovered at the time of the first operation If at the second operation a successful split of the commissures can be effected then further stenotic symptoms are unlikely to appear

In a few patients fresh attacks of rheumatic valvulitis may be responsible for the reappearance of critical mitral stenosis this can only be assumed in those cases where a really excellent valvotomy was done originally and where at the second operation the valve is found to be re fused The incidence of mitral re stenosis is in the region of 5 per cent of the authors early cases

Recently reliance has not been placed exclusively on the finger in carrying out valvotomy and mechanical dilatation of the valve is being used with a dilator introduced through the left ventricle this gives a more effective split of the com missures and it is hoped that in the future there will be fewer patients requiring re operation

In conclusion it can be stated that mitral valvotomy gives good or excellent results in nearly 75 per cent of the patients subjected to it with an operative risk

of 5 per cent However, the possibility of producing mitral incompetence, the risks of severe post operative complications and the possibility of re stenosis at a later stage demand careful consideration It is for these reasons that the authors believe that, at the present time patients should not be subjected to operation too early in the life history of the disease They consider that it is better to wait until symptoms are beginning to restrict the patient s life so that the risks of unfavourable results can be balanced against the present incapacity of the patient

MITRAL INCOMPETENCE

Mitral incompetence is caused in most patients by rheumatic heart disease and is often associated with some degree of mitral stenosis The incompetence is usually due to a combination of loss of valve substance, dilatation of the ring and shortening or rupture of the chordae, with or without calcification Attempts are now being made to correct mitral incompetence by plication of the annulus over the commissures, thus reducing the size of the mitral orifice and allowing the valve cusps to come into apposition The operation is done via the left atrium using extracorporeal circulation Encouraging reports have been published by Guidry and his colleagues (1958) and by Kay and his colleagues (1958)

AORTIC STENOSIS

Aortic stenosis is either due to rheumatic fever or to congenital disease Slight fusion of the cusps with roughening of the valve leaflets and often calcification is extremely common in elderly people but does not constitute true stenosis and should be termed aortic valve sclerosis

Pathology

In rheumatic disease the cusps become fused initially at their commissures Extension of the fusion to the margins of the cusps results in considerable narrowing and the valve leaflets become rigid distorted and frequently calcified Indeed calcification is almost the rule after the age of 35 years Calcification is prone to occur also in congenital valvular stenosis but not in the subvalvular type The increasing frequency with which aortic stenosis is now being diagnosed in young children, and the surgical confirmation available indicates that congenital stenosis is by no means uncommon The subvalvular type of congenital stenosis consists of a diaphragm with a small orifice just below the aortic valve Calcification does not occur but there is no other certain way of differentiating subvalvular from valvular stenosis clinically The association of coarctation of the aorta of course strongly suggests a congenital origin for the stenosis

In the rheumatic type and occasionally in the congenital valvular type also some degree of incompetence is common and if appreciable may make assessment of the degree of obstruction very difficult

The coronary arteries are usually widely patent although patchy ischaemic fibrosis of the myocardium is often found in severe cases It is presumably due to impedance of coronary blood flow by the obstructed aortic valve

Clinical features

Symptoms

The classical symptoms are syncope (or dizziness) angina and dyspnoea on exertion Syncope commonly occurs on effort and is due to inability to increase

the systemic blood flow sufficiently, so that cerebral blood flow becomes inadequate The angina presumably has the same cause Dyspnoea is due to left ventricular failure and attacks of pulmonary oedema may occur Right ventricular congestive heart failure is a late sequel Sudden death is presumably due to ventricular fibrillation triggered off by cardiac ischaemia

The prognosis is difficult to evaluate owing to the liability to sudden death and angina and syncope must be regarded as sinister symptoms indicating severe stenosis Patients tend to remain symptom free for many years and then rapidly deteriorate and die within 3–4 years after the onset of angina or syncope although there are exceptions to this rule Once irreversible congestive heart failure has set in life expectancy may be reduced to less than a year Mild cases may remain symptom free for 20–30 years and even live to the age of 70 years but the majority of patients become seriously embarrassed in the fourth decade

Treatment

Medical

Medical treatment has little definitive to offer and consists of general measures and management of heart failure when this occurs Nitrites may help the angina but are probably best avoided In any event patients with this symptom should at once be considered for surgical relief

Surgical

Surgery has much to offer the patient with severe aortic stenosis but the results are less satisfactory and the risks higher than in mitral stenosis Aortic valvotomy (Bailey Reduodo Remirez and Jarzalere 1952) is usually carried out via the left ventricle a tri radiate expanding dilator being introduced through a small incision and passed up to the aortic valve which is then forced open and the commissures split when the three fins of the dilator are opened Initially mortality was high—20–50 per cent partly due to the selection of cases which were really too advanced Brock (1957) reported his results in 78 cases of pure valvular stenosis There were 14 deaths 5 of which occurred in the first 8 patients all of whom were exceedingly poor risks This gives an immediate mortality of roughly 18 per cent but if the first 8 patients are excluded there were only 9 deaths in 70 patients (12 8 per cent) This probably now represents the results to be expected in skilled hands operating on properly selected patients and is certainly acceptable in the light of the poor prognosis if severe aortic stenosis is left untreated After a satisfactory valvotomy relief of angina and syncope may be expected with reduction in dyspnoea Life can be prolonged but the operation is in no sense curative since some stenosis always remains

SELECTION OF CASES —Selection of patients is a matter of the greatest importance and the following points must be considered (1) the severity of the stenosis (2) the type of stenosis (3) the presence or absence of calcification (4) the degree of aortic incompetence (5) the presence of congestive heart failure (6) the presence of other valve lesions

It is axiomatic that severe stenosis requires surgical relief, even if symptoms are absent for as has already been said patients may deteriorate suddenly and alarmingly and may drop dead without warning Once serious deterioration has set in the risks of the operation are greatly increased If the patient has the signs of severe stenosis—typical anacrotic pulse large left ventricle loud long murmur soft delayed aortic valve closure sound and marked left ventricular hypertrophy

in the cardiogram—then operation is indicated unless there are contraindications present, and these must be excluded before reaching a final decision Assessment of the severity of stenosis is aided by arterial pulse tracings In difficult cases the *gradient across the aortic valve may be measured by performing* simultaneous direct percutaneous left ventricular puncture and peripheral arterial puncture (Fleming and Gibson, 1957) In the cases reported by these authors of pure or dominant aortic stenosis which came to aortic valvotomy the peak systolic left ventricular/arterial gradient ranged from 35 to 210 mm Hg In general aortic valvotomy is unlikely to be necessary in pure stenosis if the gradient is less than 50 mm Hg Direct left ventricular puncture should not be used as a routine method, and in our opinion is not entirely free from risk

The assessment of the degree of associated aortic incompetence may be extremely difficult When it is severe, the characteristic Corrigan pulse will be present, and this constitutes a contraindication to valvotomy

The presence of congestive heart failure which cannot be relieved by medical means is a sinister sign for it usually indicates that the myocardium is extensively damaged, and unlikely to respond to relief of the valvular obstruction In such cases the mortality rate may be over 50 per cent, and surgery is not advised It must again be emphasized that patients should not be allowed to reach this stage in the disease without surgical relief Temporary right sided or left sided heart failure which responds to therapy is, of course, an indication for urgency in operating

OTHER VALVULAR LESIONS SUPERVENING —*The presence of added valvular lesions* often poses a problem. Fortunately, the commonest lesion is mitral disease and when purely or dominantly stenotic very good results can be obtained from a double valvotomy at the same thoracotomy Brock (1957) reported 34 combined *aortic and mitral valvotomies with only 3 deaths* and some of the best functional results were obtained in this group Moreover it is important to realize that the result of a good aortic valvotomy may be impaired if concomitant severe mitral stenosis is not relieved at the same time

TECHNIQUES —The aortic valve can be approached either from the left ventricle or through the aortic wall in the latter case the valvotomy can be carried out either as an open or a closed procedure

At the present time in Great Britain the transventricular route is favoured for cases of acquired calcific stenosis (Brock, 1957) but elsewhere particularly in the United States of America the aortic route is preferred on the grounds that a better assessment of the lesion can be made by digital palpation of the valve and the valvotomy can be better controlled The most suitable method *however, for non calcific stenosis whether congenital or acquired* is open cardiotomy with total cardiopulmonary by pass This permits adequate inspection and allows definitive correction of valvular or subvalvular stenosis Open cardiotomy can be performed under hypothermia but the experience of the authors has been *that patients with severe aortic obstruction tolerate hypothermia* rather poorly

AORTIC INCOMPETENCE

Chronic rheumatic infection is the commonest cause of aortic incompetence today Less frequent causes are congenital abnormalities of the valve cusps bacterial endocarditis syphilis dissecting aneurysm and severe systemic hyper tension Rheumatic aortic incompetence is usually accompanied by some degree of stenosis

Clinical features

Symptoms

A sensation of thumping in the head palpitations and dizziness may be the only symptoms for many years but left ventricular failure may occur dramatically and suddenly in the form of acute pulmonary oedema at night which may prove fatal Chronic congestive right ventricular heart failure eventually occurs some times with remarkably little preceding left ventricular failure The life span from the on et of the disease is in the region of 20–30 years and prognosis depends upon the size of the heart and the severity of the peripheral vascular signs of the aortic leak

Treatment

Medical

Medical advice early in the disease consists of recommending a light occupati and guarding against bacterial endocarditis by the prophylactic use of p nicill to cover dental and upper respiratory surgical procedures

Depression of thyroid function by carbimazole or radioactive iodine may ha a beneficial palliative effect on intractable heart failure and anginal pain but tl is seldom dramatic

Surgical

Physicians have naturally turned to surgeons for help in their attempts to reli the patient with severe aortic incompetence who is crippled by anginal pa palpitations and dyspnoea Hufnagel and his colleagues (1954) reported the of a plastic ball valve which was inserted into the upper part of the descend aorta below the subclavian artery in 23 patients 17 of whom were alive : improved up to 11 months after the operation Unfortunately the later resi have not been encouraging embolism to the legs thrombosis of the valve : severe haemolytic anaemia have been reported Attempts have been made insert prostheses into the incompetent valve and the use of silicone rubber p wogs has been described by Bailey and Likoff (1955)

RECONSTRUCTIVE PROCEDURES —It must be admitted that at the present t the surgery of aortic incompetence is unsatisfactory but reconstructive proced under direct vision using cardiopulmonary by pass have been attempted Lillehei and his colleagues (1958) They have converted the tricuspid aortic v into a bicuspid valve by suture and buttressing the shrunken contact mar with polyvinyl sponge prostheses

TRICUSPID VALVE DISEASE

Tricuspid incompetence is a very common accompaniment of congestive h failure from any caus It is du to stretching of the valve ring in associ with right ventricular hypertension and dilatation and usually disappears treatment but may be permanent when right ventricular failure has be n established In a minority of cases incompetence is due to organic disea the tricuspid valve and is associated with stenosis

Pathology

Appreciable tricuspid stenosis is almost always rheumatic and forms : 8 per cent of all cases of rheumatic heart disease coming to autopsy M o

degrees of stenosis are now being diagnosed and the incidence of tricuspid valvulitis may well be higher The mitral valve is invariably also involved and in many cases the aortic valve as well

Clinical picture

The clinical picture will depend upon which valve is most damaged and tricuspid stenosis may be masked by the signs of mitral or aortic valve disease (Goodwin and his colleagues, 1957) Alternatively, severe tricuspid disease may mask mitral and aortic disease

The anatomy of the tricuspid valve is such that it readily becomes incompetent (Hollman, 1957) and it is very probable that the vast majority of stenotic valves are also appreciably incompetent (Goodwin and his colleagues 1957)

Treatment

Tricuspid valvotomy is a well recognized operation though infrequently performed Good results have been reported but increase in the amount of incompetence is a hazard and the problems of dealing with associated valve lesions considerable for mitral valve disease may be severe and incompetence pronounced

For these reasons the authors consider that tricuspid valvotomy should be reserved for cases in which clinical and catheterization data show that the stenosis is severe while the associated valve lesions are stenotic rather than incompetent Even then, the results should be predicted with caution In the presence of moderate tricuspid stenosis severe mitral stenosis may be relieved surgically, without detriment, but if tricuspid valvotomy is performed in the presence of severe mitral stenosis the latter must also be relieved lest the improved right ventricular output overwhelm the pulmonary circulation

CONGENITAL HEART DISEASE

Atrial septal defect

Survival beyond middle age is uncommon in atrial septal defect since congestive failure supervenes sooner or later surgery therefore is indicated in all patients with uncomplicated large atrial defects Such patients may complain of fatigue palpitations and dyspnoea but are sometimes symptom free

Assessment of the size of the defect and the presence of complicating factors depends largely on special investigations particularly cardiac catheterization If severe pulmonary hypertension is present the defect should not be closed for the operative mortality is very high but otherwise a large proportion of atrial defects may readily be closed in the short period of time afforded by hypothermia Such defects are the so called ostium secundum type in which there is a complete rim of atrial septum round the defect and in which there is no associated abnormality The more complicated ostium primum defect which extends inferiorly between the mitral and tricuspid valve and is frequently associated with a cleft in one or other of these valves (common atrioventricular canal) takes a longer time to close and inevitably requires an extracorporeal circulation

Patients with anomalies of pulmonary venous drainage in combination with atrial septal defect or with associated pulmonary stenosis also require a longer time for correction than can be afforded under hypothermia However with careful selection of cases to exclude all complicated lesions very good results can be achieved with hypothermia (Bedford and his colleagues 1957) with an operative mortality of about 3 per cent The less common ostium primum defects carry

a higher mortality but the early results achieved are encouraging and it seems possible that the trend will be away from hypothermia towards perfusion in all cases of atrial septal defect to allow for the correction of unexpected and unfore seen abnormalities

Ventricular septal defect

Few patients with ventricular septal defect survive beyond the age of 40 years and many die in infancy During the first few years of life respiratory infections are common and heart failure may occur At present it is recommended that all patients with moderate size or large defects should be operated on unless there is some contraindication The exercise tolerance is no guide to selection since these patients are not usually much limited by dyspnoea on exertion

The size of the defect is gauged by physical examination radiography and cardiac catheterization Patients under the age of 2 years present considerable difficulties and at present are only operated on if there is great urgency mortality is high Improvement from the operation results because the large shunt of blood from left to right ventricle is cut off and thus the great overloading of both ventricles is eliminated In some cases however there is only a small shunt but severe associated pulmonary vascular disease leads to gross pulmonary hyper tension (Eisenmenger syndrome) usually with cyanosis These patients having only a small left to right shunt do not benefit from closure of the defect Opera tion must be done with extracorporeal circulation and in suitable cases the mor tality in experienced hands is 5–10 per cent (Kirklin and his colleagues 1957 Cleland and his colleagues 1958)

In most patients the margins of the defect can be drawn together with silk sutures but in a few a patch of plastic material has to be applied to ensure complete closure of the defect

The closure of a ventricular septal defect requires a highly trained and experi enced surgical team for uniformly excellent results Such results will come only from hospitals where large numbers of such operations can be performed and there is little doubt that they will be confined in the future to a relatively small number of special centres

Patent ductus arteriosus

When the ductus remains open after birth it leads to overloading of the pulmo nary circulation and left ventricle and sooner or later gives rise to the symptoms When it is very large it can lead to frank left ventricular failure with cyanosis and copious frothy sputum in the first few weeks of life Babies weighing under 6 lb have had successful ligation of the ductus performed More commonly the child has relatively minor symptoms but fails to develop properly is under sized and prone to respiratory infections Infection of the ductus with *Strepto coccus viridans* is a fairly common and dangerous complication Occasionally symptoms do not occur until adult life

In view of the dangers of infection and heart failure together with poor develop- ment and breathlessness on exertion it is recommended that all patients with a patent ductus should have the vessel ligated whatever their ages However if there is no urgency it is best to wait until the child is aged over 5 years to facilitate post operative care Gross (1952) reported on 525 patients with an overall mortality of 2 per cent. In good risk patients the mortality was under 0 5 per cent Operation is contraindicated if severe pulmonary hypertension

(pulmonary resistance 10 units or over) is present (Wood 1956) This lesion is probably still being overlooked in infancy and it needs emphasis that in this age group the murmur is usually systolic only and not of the classical continuous type Patent ductus is the commonest cardiac lesion in children with the rubella syndrome " and is then fairly often associated with pulmonary stenosis

Pulmonary stenosis with intact ventricular septum

If pulmonary stenosis is moderate or severe it leads to progressive hypertrophy of the right ventricle and eventually to death from heart failure Occasionally bacterial endocarditis terminates life and in general survival beyond the age of 50 years is uncommon Cyanosis is not usually present even in severe cases since the septum is closed but in a few patients a right to left shunt occurs through a patent foramen ovale However fatigue and breathlessness are usually present in patients requiring surgery and may be marked in degree In view of th progressive nature of this malady operation should be done in all except the mild cases and in assessing the severity of the stricture certain features are par ticularly helpful These are the degree of splitting of the second heart sound, the amount of right ventricular hypertrophy suggested by the electrocardiogram, and the height of the right ventricular pressure as measured by cardiac catheterization.

Treatment consists of dividing the fused valve commissures under direct vision and this procedure can be done readily under hypothermia However, it has been found in some patients that complete division of the valve has not relieved the high pressure in the right ventricle and this puzzling fact is explained by the presence of great secondary hypertrophy of the infundibulum in itself constituting an obstruction to outflow This muscle may be removed surgically through a ventriculotomy but extracorporeal circulation is necessary (McGoon and Kirklin, 1958) Infundibular resection is rarely needed in children and therefore extra corporeal circulation is only used in patients over the age of 15 years Operative mortality is about 5 per cent

Aortic stenosis

The clinical features of congenital aortic stenosis were described in the section on aortic incompetence (see page 192) Braverman and Gibson (1957) reviewed 85 children with this lesion who were seen over an 8 year period, and nearly 10 per cent of their patients died suddenly between the ages of 3 months and 15 years Over half had a previous history of syncope or fatigue but only 50 per cent had abnormal electrocardiograms This emphasizes the fact that operation should not be delayed once severe aortic stenosis has been diagnosed The authors now advise operation by means of extracorporeal circulation in all cases of congenital aortic stenosis, for this allows the surgeon time to perform a really precise and careful valvotomy and thus to avoid the production of aortic incompetence—a serious complication The valve is approached from above via an incision in the aorta Results so far in both valvular and subvalvular stenosis are very encouraging and using this technique Spencer Neill and Bahnson (1958) reported successes in 12 patients

Coarctation of the aorta

Coarctation of the aorta which gives rise to hypertension in the upper part of the body with weak or absent femoral pulses should always be looked for in young patients with high blood pressure because it is often symptomless for

many years and yet should be operated on before complications develop The blood pressure in coarctation tends to rise sharply between the ages of 10 and 20 years and it is in the third decade that unexpected deaths start to occur (Campbell and Baylis 1956) The average age at death with coarctation is 35 years and the main causes of death are aortic rupture bacterial endocarditis cerebral haemorrhage and cardiac failure Unless there is some complication operation should be done in all patients preferably between the ages of 10 and 20 years The average operative mortality in 1 600 cases collected from many centres was 8 6 per cent (Rumel and his colleagues 1957) but in the last 100 out of 270 patients operated on by Gross (1953) only 2 died About 10 per cent of patients require an aortic graft to bridge the gap left by resection of the stricture After a successful operation the blood pressure is considerably reduced but still remains slightly above normal (Cleland and his colleagues 1956)

Coarctation is a common cause of heart failure in infancy and operation should be recommended in this age group if the baby does not respond rapidly to medical treatment (Mustard and his colleagues 1955) It is especially in these younger patients that an associated patent ductus may be found

At the other extreme one sees occasional patients over the age of 40 years with coarctation and a few have been operated on Age is no bar to surgery but associated coronary artery disease should be carefully excluded

Tetralogy of Fallot

Tetralogy of Fallot consists primarily of a large ventricular septal defect with either pulmonary valvular or infundibular stenosis The patient is usually cyanosed owing to the poor pulmonary circulation sometimes deeply so but in a few the stenosis is not severe and cyanosis is noted only on exertion When cyanosis is present the prognosis is poor and survival to adult life uncommon The lesion is a very disabling one with marked limitation of exercise tolerance and sometimes attacks of unconsciousness with gross cyanosis Operation is therefore indicated in all patients

Up to recently two types of operation were performed with the aim of increasing the blood supply to the lungs namely the Blalock procedure (systemic pulmonary anastomosis) and the Brock procedure (closed pulmonary valvotomy or infundibular resection) Both operations gave quite good results but totally or partially failed to correct the basic malformation Using extracorporeal circulation it is possible to relieve the valvular or infundibular stenosis and close the ventricular defect providing that the pulmonary artery is of a large enough diameter to carry sufficient blood to the lungs If it is not then the Blalock procedure is the only treatment possible Kirklin and his colleagues (1959) have reported their results in 74 patients who have had complete correction of the lesion under extracorporeal circulation The overall mortality was 28 per cent but in the last 25 patients it was 16 per cent This last figure represents the results in the most experienced and skilled hands and emphasizes that the tetralogy of Fallot is a lesion which taxes surgical skill to the utmost

Other congenital lesions with cyanosis

Transposition of the great vessels

Transposition of the great vessels is a common lesion in infancy and usually leads to death before the age of 1 year Many attempts have been made at

correction and a few successes have been reported but it still remains a formidable surgical problem When pulmonary stenosis is associated with transposition the authors have achieved quite good results with the Blalock operation

Total anomalous pulmonary venous drainage

This is a rare condition in which all the pulmonary veins lead to the right side of the heart, it may be corrected under extracorporeal circulation (Burroughs and Kirklin, 1956)

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CHAPTER 22

PERIPHERAL ISCHAEMIA

PETER MARTIN

PERIPHERAL ischaemia may be caused by obstruction of arteries, capillaries or rarely, veins Arterial obstruction can result from injury prolonged x ray treatment, embolism or disease such as atherosclerosis, thromboangiitis obliterans (Buerger s disease) scleroderma, diffuse lupus erythematosus or other rare collagen diseases Sometimes thrombosis of a major vessel is thought to be a primary phenomenon but more probably there is always a basis of disease which is not yet apparent Capillary obstruction occurs in congenital syphilis in haemagglutination by cold agglutinins, or in association with virus pneumonia, haemolytic anaemia cirrhosis of the liver, or trypanosomiasis Massive venous obstruction or phlegmasia caerulea dolens is a rare cause of acute ischaemia By far the commonest and most important cause of peripheral ischaemia is atherosclerosis

There are differences between large vessel and small vessel obstruction and an understanding of these is necessary for diagnosis and management The commonest cause of large vessel obstruction is atherosclerosis, and of small vessel obstruction thromboangiitis obliterans though sometimes both large and small vessel obstruction are present together

Large vessel obstruction

In large vessel obstruction the distal vessels are filled through collateral channels and a circulation is maintained which is usually adequate for the part at rest or undamaged though it is unable to increase five or tenfold as may be demanded by use injury sepsis or repair Adequate care and protection of the ischaemic foot may avert gangrene often for years The more proximal the obstruction the larger are the available collaterals Often partial or even complete obstruction of the aorta or iliac arteries is accompanied by mild claudication whereas a like degree of obstruction in the femoral artery gives rise to more severe claudication and often trophic changes as well

The colour of the ischaemic foot at rest and in a horizontal position does not differ much from that of a foot sometimes the contralateral one with a relatively normal circulation On elevation the ischaemic foot pales at a lesser angle than does the normal foot On dependency there may be no difference but in the long standing case rubor may occur due to passive dilatation of the smallest vessels which owing to prolonged malnutrition have lost their muscle content When the ruborose foot is elevated again pallor reappears as though blood were being poured out of the foot as indeed it is the smallest vessels being patent

Small vessel obstruction

The more distal the obstruction the more stagnant is the distal circulation and the more interference there is with the nutrition of the tissues Trophic changes loss or looseness of digital hair wasting of the pads of the digits slowness or irregularity of nail growth persistent paronychia or even gangrene are early occurrences and may well antedate intermittent claudication The colour changes are different from those in large vessel obstruction The part is often cyanosed ruborose or, rarely pale

and the colour does not change or changes but little with alteration of posture for changes in vessel filling can only occur with difficulty Colour change which persists in spite of variations in posture is a sinister sign

Rest pain is present only in severe ischaemia and varies directly with its degree Though infarcts of nerves may occur in polyarteritis nodosa there is no such thing as ischaemic neuritis —the changes in the nerves often so described are actually those which occur as a normal process of aging They are rarely seen in thrombo angiitis obliterans a small vessel disease of middle age associated with severe local ischaemia and therefore great pain Rest pain is an important index of progress and response to treatment It is aggravated by superadded sepsis In long standing cases of large vessel obstruction it occurs in the forefoot where nutrition is failing and is associated with rubor on dependency In small vessel obstruction it is early and severe because local ischaemia is greater

ATHEROSCLEROSIS

Atherosclerosis is a disease closely associated with aging though it may occur at any age coronary artery occlusion from atherosclerosis has been seen in children It does not cause symptoms unless the vessels are narrowed by the disease or obstructed by superadded thrombosis or unless aneurysms occur Although it is a generalized disease of the cardiovascular system progress is variable and there is a marked tendency for certain arteries to be affected early while others escape Sometimes there may be obstruction of a single artery with no further incident for 10 or even 20 years though at other times progress is more rapid As the coronary arteries are so often involved death from myocardial infarction usually occurs before gangrene of the limbs develops

The arteries of the distal half of the foot and of the digits are not affected (Martin and his colleagues 1956) nor are collateral vessels although their origins may be nipped as they pass through the walls of the major vessels from which they arise The arteries of the upper limb are infrequently obstructed and ischaemia from this cause is rare In the lower limbs the arteries to be obstructed in order of frequency are the superficial femoral and upper half of the popliteal the tibials the common iliac and the bifurcation of the aorta and often obstruction is present at more than one of these sites The proximal aorta external iliac common femoral profunda femoris and peroneal arteries are rarely obstructed and peculiarly the distal popliteal artery tends to escape—a fact of great importance in planning grafting operations to by pass an obstructed femoral artery (Martin 1957)

The first symptom of atherosclerosis is usually intermittent claudication (claudicare—to limp) though sometimes the age and physical condition of the patient have so restricted his activities that this is not a complaint trophic change or even gangrene may be the first sign

When obstruction is in the aorta claudication is bilateral in the buttocks and thighs as well as in the calves and is sometimes diagnosed as sciatica although Leriche (1940) in his original description mentioned only intense fatiguability of the legs When obstruction is in the femoropopliteal artery symptoms are in the calf and occasionally also the foot where they are sometimes described as a sensation of walking on pebbles Intermittent claudication in the foot does not occur alone in atherosclerosis because if the ischaemia is sufficiently severe for this more proximal obstruction is invariably present with resultant pain in the calf In those rare patients with obstruction in the upper limb claudication is

often expressed by inability to write more than so many words, or knit more than so many stitches A symptom sometimes observed in the male is inability to sustain an erection, or penile claudication, which occurs when there is obstruction of the hypogastric artery or of more proximal arteries

When a patient presents with intermittent claudication in the leg the common femoral artery is examined If pulsation is normal here but cannot be felt in the popliteal or tibial arteries it may be assumed that the femoropopliteal artery is obstructed in some part of its course If the femoral pulse is present but diminished the common femoral artery should be ausculated If a systolic bruit is heard there is narrowing of the iliac arteries, and if it is bilateral, of both common iliac arteries or the aortic bifurcation If the femoral pulse is absent, there is either complete obstruction proximally, or the femoral artery itself is blocked —a rare occurrence

Trophic changes occur late, as the distal circulation has been maintained though reduced The earliest sign is wasting of the calf muscles often quite marked, and this is particularly characteristic of aortic or iliac obstruction The colour changes are those of large vessel obstruction, and vary with changes of posture of the limb In general trophic changes are evidence of long standing disease and a critical degree of ischaemia though digital hair is frequently lost when there is little threat of gangrene If rest pain is present even if changes of colour of the digits occur with changes of posture the onset of gangrene though not necessarily imminent, is not usually long delayed

Thrombosis

Narrowing from disease often precedes complete obstruction by several years and collateral vessels have time to enlarge The effects of an acute obstruction by thrombosis are therefore less severe than those arising from one caused by embolism or trauma In some cases, however thrombosis may be extensive and then it is almost impossible to distinguish between thrombosis and embolism though the age of the patient, the history, and the presence or absence of a cardiac lesion will make one or other highly probable

Usually there is the abrupt development of intermittent claudication and the foot is cold The leg generally recovers slowly and the claudication distance increases so that after a few weeks or months the patient can walk 100 yards or more Sometimes though it may take a year, the pain disappears altogether, not only because collateral circulation develops but also because the patient learns to avoid using the painful muscles Though there is a tendency for obstruction in one femoral artery to be followed by the same in the other a minority of patients have no further incident, even for 10 years or more The tendency for symptomatic improvement to occur spontaneously is probably the reason that credit has been accorded to certain drugs and also to certain surgical measures such as sympathectomy

Gangrene

Gangrene may supervene when a toe is injured when sepsis occurs, for example, from a nail in the shoe when spontaneous thrombosis of the digital vessel ensues on prolonged stagnation, or when an embolus arising from a proximal plaque of atheroma lodges in a digital artery Gangrene may also result from spread of thrombosis in larger vessels with blocking of the origins of collaterals and this may complicate other illness, or operation—so-called post operative gangrene

Gangrene threatens when the colour changes of small vessel obstruction are added to those of proximal disease The part becomes discoloured, usually cyanosed and the colour does not change with alteration in posture If gangrene starts in a foot already painful then a major amputation will be necessary unless arterial reconstruction can be done but if it starts in a toe after obstruction of th digital arteries then the circulation in the adjacent living tissue may be adequate In this case pain is absent a line of demarcation slowly develops and the dead tissue is cast off If however, sepsis occurs during the separation process then the adjacent living tissue will become inflamed and swollen and the smallest vessels may become obstructed or thrombosed Ischaemia is aggravated causing pain and the colour changes of small vessel obstruction appear If these spread over the dorsum of the foot a major amputation will probably be required The character of the discharge at the line of demarcation is important If it is a laudable pus then the blood supply is enough to support the life of the adjacent part because production of such pus is a process of repair but if the discharge is serous the outlook is poor

Treatment

General measures for the patient with atherosclerosis include correction of anaemia care of the feet and the most careful management of minor trauma and sepsis Dietary measures to modify the course of the disease are probably useless but weight reduction of the obese patient is important The value of long term anticoagulants has not yet been proved and the effect of smoking on patients with atherosclerosis is problematical—it is hard to deny an elderly gentleman one of the few remaining pleasures of his life

Initial sudden atherosclerotic occlusion

In the patient with an initial sudden atherosclerotic occlusion treatment should be conservative Heparin should be given as soon as the diagnosis is confirmed and Dindevan which should be continued for at least 4 weeks for there is evidence that a clot may be absorbed with prolonged use of the dicoumarols (Wright Kubik and Hayden 1953) The patient should be nursed in bed for a few days until it is clear that gangrene will not occur but he is encouraged to exercise th limb to avoid stagnation of the circulation Maximum vasodilatation is best secured by warming the body by alcohol and by deep sleep induced by barbiturates The ischaemic foot should be neither warmed nor excessively cooled and the best temperature is that obtained by leaving the end of the bed clothes open and supported by a cradle in a room of normal temperature

Mechanical aids to the circulation—intermittent venous occlusion the oscillating bed and Buerger s exercises—are valueless and may be harmful The writer has seen no benefit from the use of peripheral vasodilator drugs in these circum stances but if for psychological reasons something must be given aspirin is much cheaper In most cases circulation in the foot is not seriously impaired There is no change in sensation colour change doe not appear except for a temporary pallor on elevation and though at first there may be paraesthesiae rest pain is absent Surgery at this stage should be avoided When there is pain in the limb at rest when it is persistently pale or there is cyanotic mottling when there is loss of sensation or when the limb is cold gangrene can only be averted if some form of arterial reconstruction should prove feasible

Local sepsis

Local sepsis in an ischaemic foot gives rise to severe pain and will go on to gangrene unless energetically treated A toe nail or overlying skin should be removed to ensure drainage but this must be done through dead tissue only and it is a good rule that no anaesthetic shall be used so that inadvertent damage to living tissues may be avoided Subungual sepsis can be drained by perforating the nail in several places with an eye trephine and cutting away dead nail with a scalpel Moist dressings should be used to soften overlying scabs and dried discharges

Sometimes when the skin is gangrenous underlying tissue is alive Pain is not a feature and an arteriogram will help to distinguish this state of affairs Removal of the dead tissue will allow healing

Rest pain with no frank gangrene

A patient with rest pain but no frank gangrene needs careful consideration If artery grafting is not possible, the patient is nursed in bed for 1-2 weeks Anaemia is corrected and a good mixed diet is given The painful limb is exercised gently to avoid excessive stagnation of the blood, and is not allowed to be completely immobile A medical 'sympathectomy' is effected by reflex heating alcohol, and deep sleep at nights If with this regimen rest pain is eased then the blood flow has increased and surgical sympathectomy should be done to maintain the improvement, but if it is not eased then a sympathectomy will achieve nothing If rest pain cannot be relieved then amputation should not be delayed too long as gangrene is inevitable

If in atherosclerosis, arterial reconstruction is not practicable (*see* Chapter 23), the following are the indications for sympathectomy

(1) When release of sympathetic tone by methods short of operation has produced relief of rest pain

(2) When there are trophic changes in the digits without rest pain

(3) When severe coldness of the affected foot is a complaint

Sympathectomy should not be done for intermittent claudication *per se*

Paravertebral block has not proved a useful measure It cannot be used with anticoagulants in the acute case and in the chronic case is of no value The use of phenol by this route for its long lasting effect is dangerous and should be eschewed

In more advanced disease, especially when thrombosis aggravates previous embarrassment of the circulation the patient may present with established gangrene, or incipient gangrene, of which rest pain is a symptom and rubor on dependency a sign

Digital gangrene

Massive gangrene of a foot or worse demands a major amputation but digital gangrene needs further consideration If it is painless which means that the adjacent tissue is not critically ischaemic if this tissue shows no persistent colour changes, and especially if there is a purulent as opposed to a serous discharge at the line of demarcation, then local amputation by the guillotine method should be done, with removal of the proximal phalanx to the metatarsophalangeal joint or even of the distal metatarsal by the same route In the great or small toe the distal half of the respective metatarsal is excised by nibbling forceps as the wound

is unlikely to heal over the prominent heads of these bones If however the adjacent tissue is painful and discoloured it will not heal unless this be due to sepsis when local amputation may sometimes allow drainage and so repair but more often unless arterial reconstruction can be done—and it should always be considered—a major amputation is necessary

There is a rather uncommon form of gangrene probably due to multiple small emboli arising from a proximal plaque of atherosclerosis and lodging in the smallest vessels Ischaemia of the foot as a whole is often not severe but there are numerous phlyctenules of gangrene of the toes and foot The skin over the ends of the toes may be cast off but in the writer s experience healing has always occurred with conservative management

Major amputations for gangrene

The first major amputation of a limb should be the last The stump should heal by first intention it should be suitable for early fitting with a prosthesis and should be functional Many who suffer amputation are subject to cardiac ischaemia are elderly and have not many years to live Few will ever learn to use an above knee prosthesis because of senility or heart disease

There is an occasional place for transmetatarsal amputation when there is minimal spread of gangrene on to the dorsum of the foot when there is infection of the metatarsophalangeal joint and when rest pain is absent It should be done by nibbling away the distal metatarsal bones through an approach created by guillotine amputation of the digits Healing by granulation is acceptable for these and it will occur in 2–3 weeks if it is going to do so at all

There is no place for Syme s amputation in atherosclerosis

Some advocate a below knee amputation and have reported good results but they admit that accurate primary suture must be avoided and that healing takes place slowly by second intention Results in other hands are sometimes disappointing and re amputation is often necessary

The Stokes Gritti amputation in which the femur is divided at the adductor tubercle seems to be the best When gangrene is present the popliteal artery is obstructed and as there are no muscles here any blood reaching the leg must pass in vessels in the superficial tissues around the knee joint There is therefore always a sufficient blood supply for healing of the skin to occur unless gangrene extends more than half way up the leg Amputation by disarticulation through the knee joint requires longer flaps extending well over the muscle-covered part of the tibia where the blood supply has to some extent left the skin and subcutaneous tissues for the muscles and intermuscular planes primary healing is less certain

After a Stokes Gritti amputation the stump can be fitted with an ischial bearing prosthesis within 3–4 weeks of operation and needs no bandaging to shape it as there is no muscle at its end A prosthesis with a mobile knee joint can be fitted as soon as it has been made and the long length of femur controls it well In fact function is very nearly as good as after a below knee amputation and phantom limb pain is much less marked than after amputations either below or above the knee

For gangrene in atherosclerosis the best major amputation is a Stokes Gritti Rarely an above knee amputation is necessary when gangrene has spread to the calf muscles

Gangrene and diabetes mellitus

Atherosclerotic gangrene may occur in a patient who suffers from diabetes mellitus It differs in no way from that which occurs in the non diabetic and the management is the same Gangrene may also occur in one who has suffered long from diabetes mellitus often unsuspected, and has developed peripheral neuritis In the presence of neuritis, minor trauma passes unnoticed, sepsis occurs and is not appreciated, and infective gangrene results Often the blood flow is good and peripheral pulses are palpable though not always so as there may be an element of atherosclerosis as well If the popliteal artery is palpable it may be assumed that the major factor is diabetic neuritis Neuritic gangrene is painless the colour changes of incipient gangrene are absent, there is often thick pus as opposed to a thin serous discharge and probing of an ulcer or sinus does not hurt There will be other evidence of neuritis such as loss of tendon jerks hypoaesthesia and often weakness and wasting of the muscles Infection from an ulcer of a toe or foot commonly spreads to adjacent joints It may then extend subperiosteally up the shaft of a metatarsal and burst into the substance of the foot where it advances rapidly until the foot becomes a bag of pus Sometimes a joint is disorganized and a form of Charcot s joint results

Treatment

Treatment of neuritic gangrene depends on the fact that sepsis and not ischaemia is the cause An ulcer of a toe, not communicating with the metatarsophalangeal joint should be treated by amputation of the toe by the guillotine method and removal of the proximal part of the phalanx as far as the metatarsophalangeal joint The wound is left open If one toe has to be sacrificed, it is best to advise removal of all the toes of the affected foot because otherwise one after another of the toes will become involved If the metatarsophalangeal joint is infected, and it often is, the metatarsal must be excised through an incision in the sole of the foot and encircling the toe As the patient lies in bed drainage from a plantar incision is free, whereas with a dorsal incision pus would pocket and spread proximally A deformed foot results, but it is painless because of the neuritis In cases of diabetic neuritic gangrene a minor amputation should *not be delayed as bone or a joint is so often infected* Healing occurs readily afterwards Sympathectomy has no place in the treatment as the neuritis has involved the sympathetic nerves, and the patient has what amounts to a sympathectomy already

It must be admitted that sometimes it is not easy to distinguish ischaemic from neuritic gangrene and it is therefore justifiable, in the presence of *diabetes mellitus*, to try local amputation it is usually successful

THROMBOANGIITIS OBLITERANS

Thromboangiitis obliterans is a rare disease of small vessels, veins as well as arteries which in the majority of instances starts in the digits *The diagnosis* is established by microscopical examination of an excised vessel The disease may present as a major vessel thrombosis though probably there is also distal disease which has passed unnoticed It is segmental and episodic and sometimes it may be thought to have burned itself out, but as episodes may occur at intervals of 10 years or more it is difficult to be sure that this is so *It affects vessels of* both upper and lower limbs and sometimes visceral vessels The rate of progress is variable, fulminating disease may necessitate major amputation of all four

limbs within a year but fortunately this is rare and many patients suffer no gangrene for years or even at all

Thromboangiitis obliterans may present in the following ways

(1) Intermittent claudication in the foot or calf
(2) A persistent paronychia or ulcer of a toe usually painful
(3) Raynaud s phenomenon in the fingers
(4) Rest pain in the foot
(5) Persistent coldness of a foot
(6) Recurring superficial thrombophlebitis

As the distal vessels are especially affected distal ischaemia is severe Pain is prominent not due to any effects on nerves but from ischaemia along (*see* page 201) Trophic changes are frequent and persistent colour changes herald gangrene If in addition to severe distal disease a further episode involves larger vessels then gangrene is probable

Recurring superficial thrombophlebitis or thrombophlebitis migrans affects segments an inch or so in length of tributary veins rather than the main saphenous veins it may occur in the legs arms or abdominal wall

The cause of the disease is unknown and therefore there is no specific treatment but as there is considerable evidence that cigarette smoking is a factor this should be forbidden Prevention of injury to the extremities and careful management of minor trauma is essential

Treatment

In the acute phase the treatment is the same as that for acute arterial thrombosis in atherosclerosis (*see* page 203) Arterial reconstruction is seldom possible Sympathectomy is of distinct value in the chronic phase but should not be done if gangrene is inevitable In the presence of rest pain if this can be eased by medical treatment sympathectomy should be done but if not this measure offers little hope (*see* page 204) In the absence of rest pain or colour changes persisting irrespective of posture it is a valuable procedure and leads to the healing of ulcers and a warm dry foot—a dry foot inhibits fungus growth and for this reason may help to control infection Sympathectomy will not cure intermittent claudication but as gangrene is the greatest fear and as trophic changes are early it is probably more valuable in thromboangiitis obliterans than it is in atherosclerosis It does not of course affect the natural progress of the disease but it makes the best of what patent vessels remain

Amputations should be as conservative as possible and minor removal of tissue may well be successful as the disease is often localized at first at any rate and proximal vessels are sometimes patent A combination of proximal and distal disease in thromboangiitis obliterans usually means a major amputation

About 60 per cent of patients with this disease suffer amputations—50 per cent of them major ones—in the first 10 years after diagnosis

ARTERIAL EMBOLISM

Arterial embolism usually occurs as a complication of mitral stenosis but the clot may also arise from the atrium or ventricle in coronary infarction from a plaque of atheroma in a proximal vessel or from the wall of an aneurysm Emboli of tumour cells and even of a foreign body may occur A clot sometimes arises from the atrium in the fibrillation of toxic goitre in the absence of mitral stenosis in a patient under treatment with thiouracil The clot usually lodges

at the bifurcation of a main vessel particularly the aorta the common iliac, the common femoral, the popliteal or the brachial although it may sometimes be held up at other points particularly at the adductor hiatus The effects of arterial embolism depend on the degree of obstruction, the propagation of clot which occurs downwards and rarely upwards and which may involve long lengths of vessel, the presence of associated atherosclerosis and the condition of the heart muscle It is probable that the part played by spasm has been exaggerated and though it may occur, it does not seem to be of much clinical importance (Pickering 1951, Richards 1954)

Clinical picture

The symptoms of embolism are pain pallor paralysis and pulselessness Pain classically described as of sudden dramatic onset is of two types that which occurs at the moment of impaction of an embolus and which is probably due to distension of the vessel, and that due to ischaemia of muscles and other tissues The first type is unusual, and many embolisms in fact occur unnoticed Pallor is usual at first and is followed after a few hours by cyanotic mottling or diffuse cyanosis and cyanosis is sometimes present from the beginning Blisters later develop, to be followed by death of the tissues Motor paralysis begins shortly after the embolism and is at first associated with marked muscle tenderness From 6 to 48 hours after the incident paralysis becomes complete the muscles become tense and contracted with flexion of the distal joints and marked resistance to passive extension At this stage there will be some permanent impairment of function even if the circulation is restored After 48 hours the muscles become flaccid tenderness diminishes and the joints are mobile motor recovery is now impossible (Richards 1954) Sensory loss starts distally and advances up the limb It is of the 'stocking type and proximal to it is often an area of severe hyperaesthesia

True pulses are absent below the embolism but the level of their absence may be difficult to detect clinically as a pulse may be propagated along an obstructed segment of artery An oscillometer or sphygmomanometer may be used to estimate the site of obstruction

Embolism of an artery of the upper limb often passes unnoticed Sometimes there is temporary ischaemia which recovers in a few hours and even distal pulses return Less often some paralysis may persist from damage to muscles and rarely gangrene may result All the symptoms and signs of arterial embolism are variable and depend on the degree of obstruction the extent of consecutive thrombosis the condition of the heart and the presence of associated disease such as atherosclerosis

Treatment

As soon as possible after diagnosis 10 000 units of heparin are given intravenously and repeated every 4 hours Its effects can readily be counteracted by protamine sulphate before operation If conservative measures are to continue heparin should be used for the first 3 days Later one of the dicoumarol drugs should be given for at least 3 weeks Antispasmodic drugs have been disappointing and are not recommended They cause hypotension if given in adequate doses and may even do harm Morphine is the best drug for controlling the pain

It is rarely necessary to perform embolectomy in the upper limb but if after a short period of observation there is no improvement in the distal circulation in spite of proper treatment the artery should be explored

An aortic embolus should be removed as soon as possible this is practicable up to 12 hours after the onset of symptoms and probably later unless the limbs are dead It is useless after swelling extravasation of blood into the skin and blistering have occurred if the muscles of the limbs are flaccid recovery of function is then impossible but if they are firm and contracted causing flexion of the foot some recovery is possible If later there is sufficient blood for the basic needs of the limb that is, there is no gangrene or gangrene limited to a *toe or toes and the muscles retain their tone* then there has been little consecutive thrombosis and some form of arterial reconstruction should be considered

Embolism of the bifurcation of the common iliac artery should be treated similarly but with femoral and popliteal embolism the decision is less easy It is true that conservative treatment has sometimes resulted in minimal loss of tissue or even no loss at all On the other hand exploration of the common femoral artery under a local anaesthetic is a minor procedure, and early removal of an uncomplicated embolus is very satisfactory Access to the popliteal artery and even the posterior tibial artery may be necessary at the same time if there has been consecutive thrombosis and this is impracticable under local anaesthesia The femoral popliteal and posterior tibial arteries can be exposed in a patient lying on his back with the thigh abducted and externally rotated and the knee flexed If the patient s cardiac condition is critical the common femoral artery is first exposed under local anaesthesia and if the embolus can be removed and there is a good retrograde blood flow nothing more is done If there is consecutive thrombosis a risk must be accepted and a general anaesthetic is started The popliteal artery is exposed and if it is empty of clot the thrombus can be washed out of the femoral artery from below with saline solution If the popliteal artery is obstructed then the posterior tibial artery can be used for this purpose The saline solution is injected under considerable pressure to expel the clot

It often happens that patients suffer showers of emboli after which they may escape further embolism for long periods Mitral valvotomy should be considered if possible at the time of the embolectomy or as soon as possible afterwards (*see* Chapter 21)

In the chronic stage of limb embolism without gangrene the patient should be treated either by vascular reconstruction or by sympathectomy according to the extent and site of the obstruction and the condition of the heart

Nearly 50 per cent of the patients die who enter hospital with arterial embolism A bolder approach to surgical treatment might improve this state of affairs

VASOTONIC DISORDERS

Raynaud's phenomenon

Intermittent attacks of cold dead fingers or Raynaud s phenomenon are a frequent complaint and may be either of little significance or symptomatic of severe disease

THE MECHANISM —One of the functions of the skin is to conserve heat and to vary the rate of h at loss For this the fingers and to a lesser extent the hands are particularly well adap ed Not only have they a surface area in proportion to their volume matched only by the ears but also the rate of blood flow through them can be varied physiologically over an exceptionally wide range The calibre of the digital vessels

is controlled partly by the local temperature and partly by impulses of central origin conveyed through the sympathetic nerves They are increased if the whole body is cold or to a lesser extent by emotion and decreased when the body is warm In a Raynaud s attack there is such marked constriction of digital arteries that blood flow ceases altogether and a finger does not bleed when pricked

Such a striking reaction for heat conservation does not occur in most normal people except in quite exceptionally severe conditions when both body and hands are excessively chilled although Hunt (1936) was able to induce Raynaud s phenomenon in his own fingers by sufficiently reducing his body temperature However there are many people of either sex who do manifest such reactions even in cold of a degree ordinarily encountered This is Raynaud s phenomenon in its simplest form and is not pathological being rather an exaggeration of a normal (physiological) process (Monro 1899)

If there is any pathological narrowing of the digital arteries the normal physiological response to cold is more liable to result in complete occlusion of digital arteries and therefore Raynaud s attacks The more severe the obstruction the more readily does the phenomenon occur and eventually one factor alone either bodily cold or local cold may be sufficient to produce an attack by itself Lewis (1936) noted that in patients with severe Raynaud s disease an attack could be induced by cooling the base of a digit whose sympathetic nerve supply had been interrupted by local anaesthetic block of the somatic nerve He deduced from this and other observations that there was some local fault in the digital arteries which he judged to be a peculiar sensitivity to cold in the arteries themselves However from inspection of digital arteriograms it seems that in these severe cases narrowing or obstruction of the digital artery is more probably the cause

CLASSIFICATION —Raynaud s phenomenon is therefore of two main types (1) primary Raynaud s phenomenon when the digital arteries are normal and (2) secondary Raynaud s phenomenon when there is narrowing or obstruction of the digital arteries from any cause

Primary Raynaud s phenomenon

Although usually called hereditary cold fingers, primary Raynaud s phenomenon is a better name for this condition It is often seen in children of either sex especially at the age when first exposed to local bodily cold It may also occur for the first time in later years up to the twenties and rarely even later and it is often associated with chilblains or with acrocyanosis It is never complicated by trophic changes in the digits though it may get worse with advancing years because intimal thickening associated with aging somewhat reduces the lumen of the digital arteries

In the absence of arterial obstruction it is necessary for local cold and coldness of the whole body to be present together before Raynaud s phenomenon occurs Even in a susceptible person an attack cannot be induced by local cooling of a digit if the body is warm as in a hot bath or if the body is cold and the hand warmed Local anaesthetic block of a somatic nerve always relieves an attack Arteriography of the digital vessels never shows arterial narrowing or obstruction, and the appearances are indistinguishable from those which are seen in persons who have never suffered from Raynaud s phenomenon The condition is rarely severe and there are no complications The patient may be reassured as regards the prognosis, and treatment is not often necessary

Secondary Raynaud s phenomenon

Secondary Raynaud s phenomenon may be seen in the following circumstances (1) trauma—cold isolated injury and vibration injury (2) collagen disease—scleroderma and probably Raynaud s disease disseminated lupus erythematosus

rheumatic fever and rheumatoid *arthritis* polyarteritis nodosa and dermatomyositis (3) nervous disorders resulting *in* disuse (4) obliterative vascular diseases—*atherosclerosis* thromboangiitis *obliterans* arterial embolism and thrombosis and cervical rib (very rarely) (5) stasis in the smallest vessels—syphilitic arteritis cold haemagglutination and in some severe general illnesses such as leukaemia polycythaemia, advanced pulmonary tuberculosis and malaria and (6) certain intoxications—ergot poisoning and heavy metal poisoning

The severity of secondary Raynaud s phenomenon depends entirely upon the degree of digital artery obstruction it therefore increases with advancing disease and trophic changes soon appear These consist of shiny smooth digital skin wasting of the finger pads slowness and irregularity of *nail growth* recurrent or persistent paronychiae phlyctenular gangrene and, rarely massive gangrene *of a* finger When disease of the digital arteries is advanced *local cold alone* may be sufficient to induce an attack It is *important to recognize such cases,* for in these sympathectomy is of no value When the blood supply becomes critical and gangrene is threatened pain occurs and may be severe but otherwise pain is not present unless there is sepsis

Conditions associated with secondary Raynaud s phenomenon

VIBRATION INJURIES —In patients who use vibrating tools it is said that there is no evidence of digital artery damage and that the vibration injury causes hypersensitivity of the arteries to cold On the other hand cases of gangrene have occurred Many investigations of vibration injury have been made by means of digital temperature recordings and reflex heating tests but these are not very accurate methods of measuring digital blood flow Direct injury *to the arteries* with subsequent narrowing or obstruction seems a more probable cause

COLLAGEN DISEASES —The so-called collagen diseases probably better called diffuse systemic scleroses consist of a number of syndromes which may overlap one another Thus scleroderma may be associated with joint changes *simulating rheumatoid arthritis* rheumatic heart disease and polyarteritis nodosa not infrequently occur together

Scleroderma is a fairly clear-cut syndrome consisting of sclerosis *of the skin* of the fingers hands forehead ears nose neck shoulders and upper part of the back and front of the chest For a long time *or* even permanently skin changes may be limited to the fingers and in about 50 per cent of the cases there is an associated Raynaud s phenomenon owing to organic obstruction of the digital arteries In fact the vascular changes may antedate skin thickening by as long as 5 years or more so that they may be the only evidence of the disease and it is often only after a long period of observation of a particular patient that the diagnosis of scleroderma becomes clear The disease may start at any age in either sex but is more common in women between the ages of 30 and 50 years When Raynaud s *phenomenon is the first* symptom this g is worse rather rapidly deterioration certainly being apparent over two winters although sometimes even more quickly Trophic changes soon occur and calcinosis and bone absorption may be seen Stiffness of the fingers is a common complaint even before skin changes appear Later and it may be some years after the onset of vascular changes there may be *thickening* and loss of elasticity of the digital skin and at about the same time a stiffness of the skin of *the forehead* and around the mouth Dysphagia may occur from sclerosis of the oesophagus but sclerosis *is found* more often on routine radiological *examination* than because suggested by dysphagia The disease progresses in waves of activity and may at *any time* become stationary

It is curious that digital artery disease rarely progresses to massive gangrene although the writer has seen this on a few *occasions* In all patients with Raynaud s phenomenon *in association* with scleroderma arteriography *shows* evidence of digital artery narrowing *or occlusion*, and trophic changes soon occur Raynaud s *disease* indicates those with a severe and progressive vascular phenomenon in the digits without other skin changes but the longer such patients are *observed the greater the number*

who develop these changes Whether Raynaud s disease as an entity separate from scleroderma exists at all appears doubtful for in most descriptions of this condition eventual sclerosis of the digital skin has been remarked upon as frequent The vascular changes of scleroderma are almost always symmetrical and symmetry is also one of the characteristics of Raynaud s disease

In the other collagen diseases in which Raynaud s phenomenon is seen, the associated disorders are more prominent and the phenomenon often of lesser importance

THROMBOANGIITIS OBLITERANS AND CERVICAL RIB —In thromboangiitis obliterans in which the digital arteries are often diseased Raynaud s phenomenon is common. In the very rare examples of cervical rib in which the phenomenon occurs it lasts only a short time as gangrene soon supervenes owing to emboli from the damaged subclavian artery lodging in the distal arteries

Treatment of Raynaud s phenomenon

For minor degrees of primary Raynaud s phenomenon all that is required is protection of the body and the hands from cold by suitable clothing Vasodilator drugs are of some value but often cause a generalized disturbance which is upsetting to the patient If symptoms are a real handicap to work and to enjoyment of life sympathectomy should be advised, for the results are good At first there is complete loss of vascular tone though this recovers within a week of operation return of excessive vascular tone is more variable and longer delayed In the lower limb it is minimal though in the upper it is often more evident and earlier in its reappearance Within 6 months some return of sympathetic activity can be detected in about 40 per cent of patients and after 2–3 years it may be well marked Recovery becomes complete in about 10 per cent However in primary Raynaud s phenomenon depression of sympathetic activity even slightly below pre operation level is sufficient to relieve the symptoms

In secondary Raynaud s phenomenon apart from avoidance of cold and a trial of the peripheral vasodilators treatment depends upon the degree and future course of the digital arterial disease and the calculated effects of sympathectomy After frostbite, or injury, whether by single or constantly repeated trauma there is good reason to suppose that the vascular obliteration will not progress but when the obstruction results from disease such as scleroderma it is probable that arterial obstruction will increase though how rapidly is unknown It may advance only over many years In the earlier stages of digital artery obstruction and when trophic changes are beginning sympathectomy is often a useful procedure but it should never be advised when arterial obstruction is so advanced that local cold applied to a digit will induce an attack of the phenomenon even though the body is warmed or when the part is temporarily sympathectomized by local anaesthesia of the ulnar or median nerves If local cold alone is sufficient to close the digital arteries completely sympathectomy cannot prevent the attacks Many patients with secondary Raynaud s phenomenon have been materially benefited by cervical sympathectomy but it must be admitted that a further wave of activity of disease may cause relapse quite apart from that which occurs from sympathetic regeneration

When the nature of the Raynaud s phenomenon in any particular patient is considered, when the progress of the disease is considered and when the limits of what can be expected by sympathectomy are appreciated there are still a number of patients whose condition can be greatly improved by this simple procedure It must be remembered that sympathectomy is the most effective treatment available a fact which is not sufficiently appreciated

Acrocyanosis

Acrocyanosis is a condition characterized by symmetrical blueness and coldness of the hands and less commonly the feet There is no intermittency of attacks so the condition should not be confused with Raynaud s phenomenon Cold is the pre cipitating factor to which the arterioles seem to react by contraction with unusual vigour The condition is not usually more than an annoyance to the patient, but in some it is severe and if it persists to old age may result in gangrene of the tips of the toes Although probably the fault lies locally in the arterioles sympath ectomy is more effective than any other treatment and a number of patients have been so treated particularly the more elderly where gangrene is threatened or present Ordinarily in younger patients symptoms can be relieved by the use of mittens or woollen socks in the colder weather Sympathectomy should sometimes be considered and in those who are severely handicapped it is curative

Chilblains

Chilblains erythrocyanosis nodular vasculitis and Bazin s disease are some of the terms which have been applied to a condition for which a preferable title is the chilblain phenomenon The chilblain appears to be the result of a local sensi tivity of the skin vessels to cold and damp It is often but not always associated with acrocyanosis Chilblains in the acute phase are reversible and the affected parts become normal in the summer but chronic chilblains are often complicated by fat *necrosis* and *ulceration* and the smaller vessels may be obliterated by endarteritis so that complete resolution is impossible Apart from the prevention of chilblains by protection from cold of the susceptible parts the only treatment which is effective is abolition of sympathetic tone Sometimes the vasodilator drugs have some effect but are usually disappointing Sympathectomy is effective but in the s verely ulcerated case when the degree of arterial obstruction is such that complete recovery is impossible scarring will remain However even in the worst cases further *deterioration is prevented* and in less severe ones the results are very good Among more than 50 patients operated upon there was only 1 with an unsatisfactory result

Sometimes there is considerable swelling of the lower leg which is worse in warm weather and this will not be relieved by sympathectomy The patient should be warned of this as often it is the swelling more than the chilblains of which the patient complains Sympathectomy is best avoided in such a case

Chilblains of one limb are often the result of a minor attack of anterior polio myelitis Sympathectomy should be advised if the chilblains are troublesome

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CHAPTER 23

ARTERIAL RECONSTRUCTION

CHARLES ROB

ARTERIES may be reconstructed in a number of ways, but all techniques aim at restoring or maintaining a normal or nearly normal blood flow These techniques differ fundamentally from those such as sympathectomy, which aim at increasing the flow through the collateral circulation Arterial reconstruction operations are indicated in certain patients who have occluded major arteries, whether the occlusion be due to congenital abnormality, injury or disease such as atherosclerosis or thromboangiitis obliterans, they are also indicated for aneurysm or arterio venous fistula In this chapter the indications for arterial reconstruction will be discussed under the headings both of symptoms and of diseases

ARTERIAL THROMBOSIS DUE TO ATHEROSCLEROSIS

Intermittent claudication

Intermittent claudication a common symptom is caused, in over 90 per cent of patients, by a major arterial thrombosis secondary to atherosclerosis Other causes include occlusions of small arteries and anaemia The artery most often involved is the superficial femoral, but thromboses of the popliteal artery the abdominal aorta and iliac arteries are frequently seen In a series of 142 patients with intermittent claudication of the calf muscles Mavor (1956) found that an occlusion of a main artery was the cause in 139 (97 8 per cent) in 134 of these patients the site of the occlusion was the femoral or popliteal artery and in 5 the aorta or iliac arteries In our experience at St Mary s Hospital London the incidence of aortic and iliac thrombosis has been much higher (Table I) but many of these patients were specially referred to us for surgery

When deciding upon the treatment of a patient with intermittent claudication it is of great importance to take into account the tendency towards spontaneous improvement What apparently happens when a patient develops atherosclerosis is that though the arteries in his lower limbs are narrowed, few symptoms develop until an artery becomes occluded or nearly so, by thrombosis Symptoms now start but soon begin to improve as the collateral circulation develops they then remain stationary, often for months or years until the thrombus extends or a new one appears at another site in the arterial tree, again the symptoms become more severe and again improve though this time to a lesser extent as the new collateral circulation develops

Another important consideration is the state of the rest of the patient s arterial system Atherosclerosis may be a general disease affecting perhaps in some patients, all the arteries in the body a surgical operation, whether it be a sympathectomy or an arterial reconstruction can only have a local effect surgery is therefore only justified when the local effects of this general disease predominate to an unusual extent (Rob and Eastcott 1953) The expectation of life of a patient with intermittent claudication due to atherosclerosis is reduced (Hines and Barker,

1940 Richards 1957) and for this reason as well as for those already given operation is advised only when the disability is severe and interferes with the patient's daily life A few minute explanation can often restore a patient's confidence and save him an unnecessary operation When selecting patients with intermittent claudication for direct surgery one should exclude patients with evidence of coronary artery disease or of gross generalized atherosclerosis The patient's age disability family history general health and also the state of the retinal arteries are important The ideal patient has a localized occlusion of one artery with relatively normal arteries elsewhere (Rob 1955)

TABLE I

SELECTION FOR OPERATION IN 956 PATIENTS WITH OCCLUSIVE ARTERIAL DISEASE

Arteries	*Number of patients*	*Number treated by medical measures or sympathectomy*	*Arterial reconstruction (percentages in parentheses)*
Aorta and iliacs	195	91	94 (48·2)
Femoral and popliteal	703	470	223 (30·2)
Internal carotid	64	25	39 (60·1)

As a result of the experience outlined in Tables I and IV an arterial reconstruction is now advised in about 50 per cent of patients with intermittent claudication due to thrombosis of the aorta and iliac arteries and about 30 per cent of patients with a thrombosis of the femoral or popliteal arteries Associated diabetes mellitus is only a contraindication in so far as diabetics tend to have a more generalized type of atherosclerosis

Gangrene and rest pain

It is possible to avoid a major amputation by operation for arterial reconstruction in about 25 per cent of patients with gangrene or severe rest pain In these patients

TABLE II

CAUSES OF GANGRENE OF THE LOWER LIMB IN 145 PATIENTS (18 BILATERAL) (ROB 1957)

Atherosclerosis	
Main vessel occlusions	125
Small vessel occlusions	90
Main and small vessel occlusions	11
Thromboangiitis obliterans	24
Embolus	12
Infective or neuropathic gangrene in diabetics	6
Venous gangrene	4
Arterial injury	3
Dissecting aneurysm	3
Thrombosed aneurysm	
Raynaud's phenomenon	2 each
Polyarteritis nodosa	
Neonatal	
Radiotherapy	1 each
Congenital arteriovenous fistula	

there is little difficulty about selection for such operation because a major amputation is also a major operation and when this is the only alternative an operation which preserves the limb is obviously preferable Indeed from the patient's point

of view an arterial reconstruction operation is the less severe Advanced generalized atherosclerosis is not a contraindication to arterial reconstruction in these patients, neither is even a previous coronary infarction provided that the patient can stand an anaesthetic Table II (Rob 1957) gives the causes of gangrene in 145 patients treated in the period 1950–1956, it will be seen that a main vessel occlusion was responsible in 90 (63 per cent) of the limbs A review of these cases in the light of the knowledge which we have today shows that it would have been anatomically possible to perform an arterial reconstruction in 67 of these 90 limbs, a proportion of the patients would have been unsuitable for arterial reconstruction for other reasons but even so the number of limbs which could have been saved exceeds those which were actually saved

TABLE III
OPERATIONS FOR GANGRENE OF THE LOWER LIMB IN 145 PATIENTS (18 BILATERAL) (ROB, 1957)

Arterial reconstruction	30	Amputation	94
Successful	20	Level with healing	
Unsuccessful	8	Above knee	34
Died	2	Below knee	26
Embolectomy	3	Transmetatarsal	9
Sympathectomy	81	Toe or toes	19
Of value	55	Local excision	4
Valueless	24	Died in hospital	2
Died in hospital	2	Nothing surgical	12

An arteriogram should precede an amputation in patients with gangrene and evidence of a main vessel thrombosis If this shows a suitable lesion then an arterial reconstruction should be carried out

Type of operation

An artery may be reconstructed by direct anastomosis, by the operation of thromboendarterectomy or by the insertion of one of a number of arterial substitutes including autogenous vein grafts homologous arterial transplants and plastic cloth prostheses Table IV gives the results which have been obtained since 1950 with operations of these types for a variety of conditions but mostly for atherosclerotic thromboses and arterial aneurysms

TABLE IV
METHOD USED IN 487 ARTERIAL RECONSTRUCTION OPERATIONS

Operation	*Number of patients*	*Dead (including operation deaths)*	*Thrombosed early and late*	*Patent at time of writing*
Direct suture	34	3	2	29
Thromboendarterectomy	115	3	11	101
Autogenous vein	44	4	18	22
Homologous artery	228	14	57	157
Plastic cloth	40	6	1	33
Polyvinyl alcohol sponge	26	6	12	8

Direct suture

Direct suture is undoubtedly the best procedure but can only be employed when the arterial ends can be approximated Suitable patients are those with coarctation of the aorta or with clean knife wounds and, curiously, some elderly patients with

clos d injuries atherosclerotic stenoses or aneurysms These elderly patients are favourable because they have arteries which have become lengthened and tortuous it is therefore possible, after mobilization to close a much bigger gap by direct suture in many elderly patients than in more youthful ones Direct suture is usually accomplished with an over and over suture of fine silk although a variety of mechanical aids have been developed (Androsov 1956 Kovanov 1956 Tibbs and Leslie 1958)

Thromboendarterectomy

Thromboendarterectomy is only applicable when an artery is occluded by a thrombus or stenosed by atherosclerosis The operation consists in the removal of the thrombus the intima any plaque of atheroma the internal elastic lamina and the inner portion of the media At the end of the operation the arterial wall consists of only the outer part of the media the external elastic lamina and the adventitia but experience has shown that this attentuated arterial wall is well able to withstand the arterial blood pressure and aneurysms do not form Thromboendarterectomy is a particularly useful operation for localized occlusions of large arteries such as the aorta and common iliac arteries particularly when the distal arterial tree is relatively normal As Table IV shows with careful selection the results of this operation can be very good indeed

Autogenous vein grafts

Autogenous vein grafts have the advantage that they survive transplantation and form a permanent living union with the tissues at the host site Unfortunately as Table IV shows they give disappointing results in clinical practice The writer believes the reason for this to be that the saphenous veins of patients with athero sclerosis are often themselves abnormal and therefore have a tendency to thrombose when used as arterial substitutes

Homologous arterial transplants

Homologous arterial transplants are particularly valuable for the treatment of aneurysms and of thrombosis of the aorta and for thrombosis of the femoral and popliteal arteries In the case of aortic replacement a prosthesis of plastic cloth appears to work as well but unfortunately this is not the case with femoral and popliteal arteries A great variety of plastic prostheses have been recommended but after using Terylene (Dacron) crimped nylon polyvinyl alcohol and Teflon the writer believes that when used to replace femoral or popliteal arteries 90 per cent of plastic prostheses become blocked by thrombus within 1 year Perhaps future plastics will be more successful but so far (October 1958) the only materials found satisfactory for femoropopliteal *by pass grafts* have been homologous arterial transplants and sometimes autogenous vein grafts

Plastic cloth prostheses

Though unsatisfactory for the replacement of smaller vessels plastic cloth prostheses work well as substitutes for the aorta or its major branches Of the various plastic cloths Terylene (Dacron) has been the best for aortic replacement when no suitable *homologous* arterial transplant has been available When discussing plastic prostheses as arterial substitutes it must be stressed that they were first used only in 1952 (Vorhees Jeretzki and Blakemore) and therefore their long term behaviour is still unknown there is some as yet unconvincing evidence

derived from rodent experiments that some of these materials may be carcinogenic (Oppenheimer and his colleagues, 1955)

Arterial thrombosis in special sites

The internal carotid and vertebral arteries

Approximately 20 per cent of cerebrovascular accidents are due to thrombosis of the cervical portions of the internal carotid or vertebral arteries, at points accessible to the surgeon Moreover, many patients who have stenosis of the cervical portions of the internal carotid artery or vertebral arteries due to atherosclerosis have relatively normal intracranial vessels (Hutchinson and Yates 1957) In 1954 the writer and his colleagues reported the first successful arterial reconstruction for internal carotid occlusion (Eastcott, Pickering and Rob 1954) Further cases were reported by Edwards and Rob (1956) and Rob and Wheeler (1957), since then more patients have been treated with results which are summarized in Table V From this experience the following opinions have evolved Occlusion of the internal carotid artery may be partial or complete Clinically it is usually impossible to distinguish between these two types and the final diagnosis may have to be made either by arteriography or by surgical inspection of the carotid bifurcation An exception may be made of a small number of patients in whom a systolic murmur is audible over the region of arterial stenosis

TABLE V
OPERATIVE RESULTS IN 64 PATIENTS WITH INTERNAL CAROTID ARTERY OCCLUSIONS

Type of occlusion	*Hypothermia*	*Number of patients*	*Good flow established*	*Post operative course*				
				Asymptomatic	*Objectively better*	*No change*	*Temporary deterioration*	*Death*
Partial	used	46	46	28	8	8	2	—
	not used	2	2	1	—	—	1	—
Complete	not used	16	4	1	1	12	—	2
Total		64	52	30	9	20	3	2

As shown in Table V the results of surgery in patients with partial occlusions of the internal carotid artery are much better than in those with complete occlusions The view is now held that it is only worth operating upon a patient with a complete occlusion when the history is very short, or there is evidence on the arteriogram of patency of the vessel distal to the thrombosis With partial occlusions the results of surgery have been good and long follow up shows a satisfactory picture for example, the patient operated upon in 1954 who was then aged 66 years is alive and well 4½ years later Restoring a satisfactory blood flow in these patients with partial occlusions not only frequently relieves the symptoms of cardiovascular insufficiency but may also prevent the later development of a complete thrombosis resulting in irreversible cerebral damage

Patients with partial occlusions should be operated upon under hypothermia (29–30°C) a precaution which is not necessary when the occlusion is complete Of the various operations, thromboendarterectomy is the most generally applicable with direct anastomosis or blood vessel graft as alternative procedures Thromboendarterectomy works here because the atheroma is usually well localized to the

origin of the internal carotid artery the blood flow is fast and above all the artery distal to the occlusion is surprisingly normal A similar operation may be employed for vertebral arterial stenosis but in the writer s experience reconstruc tion of th internal carotid artery has been sufficient in most cases

The renal arteries

Stenosis of a renal artery is now recognized as one cause of severe arterial hypertension which may be relieved if an obstructed blood flow to the kidney is restored The literature now contains reports of a number of such cases and the subject has recently been reviewed by De Camp and Birchall (1958) At the moment a firm diagnosis can only be made by aortography and it appears that this investigation is justified when a patient has severe arterial hypertension of unknown cause without evidence of primary renal disease his general health being good enough to permit operation if the arteriogram shows a stenosis of the renal artery

Freeman and his colleagues (1954) reported relief of hypertension following the treatment of a stenosis of the renal artery by the operation of thromboendarter ectomy Poutasse and his colleagues (1956) reported the successful relief of hyper tension in a patient with bilateral renal artery stenosis following the insertion of two homologous arterial transplants An alternative procedure when the stenosis is unilateral is to perform a nephrectomy

A number of patients with stenosis of the renal arteries have been treated in the writer s department and the results are considered satisfactory (Rob 1956) It is not yet known what proportion of patients with renal artery stenosis develop hypertension and in how many this hypertension can be relieved by surgery

The arteries to the upper limb

Thrombosis of these vessels is uncommon and symptoms as a result of such thrombosis are rarely severe There is however one type of arterial occlusion in this region which merits special attention and this is the large plaque of atheroma which sometimes occurs across the dome of the arch of the aorta and which may spread up into the origins of the innominate carotid and subclavian arteries This is one of the reasons for the development of pulseless disease (Takayusu 1908) In these patients a thromboendarterectomy of the first portion of the innominate carotid or subclavian arteries and the adjacent portion of the arch of the aorta may produce a satisfactory result (Warren and Triedman 1957)

The coronary arteries

In spite of the fact that a great deal of experimental work has been carried out the writer agrees with Wood (1955) when he stated that operations for ischaemic heart disease have not yet graduated from the experimental class Such operations are not at present suitable for general use

Superior mesenteric artery

Klein (1921) described the clinical features of chronic mid gut ischaemia and noted that there were three main symptoms abdominal pain, altered bowel habit and loss of weight probably due to malabsorption At that time the only investi gations of which positive results were reported were for occult blood in the stools and some biochemical changes owing to malabsorption today aortography may show a stenosed or occluded superior mesenteric artery Klein used the term intermittent mesenteric claudication to describe the symptoms The subject has been recently reviewed by Mavor and Michie (1958) The first successful

treatment of this lesion by restoring a normal flow through the superior mesenteric artery has been reported by Shaw and Maynard (1958) Previous to this Klass (1953) and Weel (1956) have limited the extent of intestinal necrosis by reconstructing the superior mesenteric artery in patients with recent occlusions of this vessel

Prolonged anticoagulant therapy

Although the value of this form of treatment is still being debated the writer believes it to be useful after operations for arterial reconstruction in patients with arterial occlusion due to atherosclerosis or thromboangiitis obliterans but unnecessary after arterial reconstructions for other lesions, including arterial aneurysms By this means it is hoped to reduce the incidence of recurrent thrombosis, not only in the artery which has been reconstructed, but also in other vessels such as the coronary arteries

ARTERIAL ANEURYSMS

The aorta

Until 1951 (Dubost, Allary and Oeconomos) there was no effective treatment for aneurysms and the prognosis was grave Colt (1927) studied a large number of cases collected from various sources, and he found that the average survival of 503 patients with thoracic aneurysms and 121 with abdominal aneurysms was less than 2 years from the date of diagnosis 82 women with aortic aneurysms lived 3 months longer, on the average than the men He also noticed that the expected survival period of a patient with an aortic aneurysm was twice as great if he were aged 60 years when the condition was first diagnosed than if he were aged 35 years or younger These figures paint a gloomy picture Colt excluded all dissecting aneurysms, moreover from this series Estes (1950) in a similar study found that 33 per cent of 102 patients with abdominal aneurysms had died within 1 year of diagnosis, that only 10 per cent were alive 8 years later, and that the cause of death was rupture of the aneurysm in 63 3 per cent of those who died

The excision of an aortic aneurysm and its replacement with a homologous arterial transplant or a plastic prosthesis is a major operation but in experienced hands the mortality from all operations including emergency ones for ruptured aneurysms is now about 20 per cent and much lower if the emergency operations are excluded (De Bakey Cooley and Creech 1955 Rob, Eastcott and Owen 1956) The death rate varies considerably with the situation of the aneurysms operations for aneurysms of the proximal aortic arch having a much higher mortality than those for the distal aortic arch and descending thoracic aorta In the case of the abdominal aorta over 95 per cent of aneurysms are below the renal arteries and the risks of surgery here are lower than those for the few aneurysms which develop in the upper abdominal aorta Once the patient has survived the immediate hazards of operation the outlook is good and it is probable that as experience increases the mortality of operation will fall still further

Peripheral arteries

Most peripheral arterial aneurysms apart from congenital aneurysms of the intracranial arteries occur in the limbs Here the risk to life is not great but the risk to the limb is considerable Gifford Hines and Janes (1953) reported on a series of 100 popliteal aneurysms in 20 patients the aneurysm caused loss of the limb, either at the first visit to hospital or soon afterwards in most cases because

of thrombosis or of an embolus arising from the sac and lodging distally They concluded that awaiting so-called spontaneous cure of an aneurysm involves a high incidence of ischaemia and a substantial risk of loss of the limb These hazards should be avoided The writer s experience is similar and since operation gives good results he believes that aneurysms of popliteal arteries should be treated surgically

ARTERIAL EMBOLISM

In general arterial emboli are treated conservatively (*see* Chapter 22) Reasons for this include the adequate response in many patients and the fact that emboli often arise in patients with cardiac lesions which have become uncontrolled a good surgical result is therefore likely to be spoilt by the death of the patient or the development of another embolus However when medical measures are failing to restore the circulation embolectomy is justified and if combined with the retrograde flush technique (Lerman Miller and Lund 1930 Crawford and De Bakey 1956) may be performed successfully as long as 36 hours after the original episode But if surgery is to be performed the earlier the better and if after a few hours medical care the return of circulation is insufficient operation should be as an emergency

INJURIES

Arterial injuries may be open or closed a closed injury may be associated with a fracture and often results in arterial thrombosis rather than arterial rupture The treatment of choice for both open and closed injuries of major arteries in civilian practice is immediate operation and arterial repair By this means the viability of the limb is preserved and the delayed ischaemic effects of arterial ligation such as intermittent claudication are abolished (Jahnke and Seeley 1953) Adequate figures are not available from civilian practice but numerous papers have been based on military experience Table VI gives the amputation rate after arterial injury in war Figures from the British Army in World War I (Makins 1919) and the United States Army in World War II (De Bakey and Simeone 1946) have been combined

TABLE VI
AMPUTATIONS AFTER ARTERIAL INJURY IN WAR

Artery	*Number of patients*	*Amputations (percentages in parentheses)*
Aorta	8	7 (87 5)
Subclavian	61	10 (16 4)
Axillary	182	37 (26 4)
Brachial	801	171 (21 3)
Radial and ulnar	28	11 (39 3)
Common iliac	14	8 (57 1)
External iliac	34	24 (41 0)
Femoral	883	349 (39 5)
Popliteal	646	426 (65 9)
Anterior and posterial tibial	98	64 (65 3)

COARCTATION OF THE AORTA

Coarctation of the aorta as an indication for arterial reconstruction has been discussed in Chapter 21 Only the occasion for using an arterial substitute in such a patient will be considered here When this is necessary it is not the

presence of a long stenosis which makes it so but an associated aneurysm Such aneurysms are usually mycotic and follow bacterial infection of the coarctation itself The outlook is particularly good when compared with aneurysms of the thoracic aorta from other causes The writer has operated on 12 such patients without a death One reason for this success is the presence of adequate collateral circulation which makes the use of either hypothermia or by pass procedures unnecessary

POST OPERATIVE MANAGEMENT

The use of anticoagulants has been discussed Other important measures include the maintenance of an adequate blood pressure throughout the post operative period and early movements to reduce the incidence of venous thrombosis Convalescence, after an arterial reconstruction operation varies with the artery reconstructed and the reasons for the operation

After resection of an aortic aneurysm the patient requires about 14–18 days in hospital, and a further period of 3 months before he is fit for work After a reconstruction for an aortic thrombosis these periods are slightly shorter A patient who has a femoropopliteal by pass graft for intermittent claudication can leave hospital after 10–14 days and resume light work in 6 weeks When the reason for operating is gangrene, the deciding factor will be the extent of the gangrene After internal carotid reconstruction without complications patients may leave hospital in 1 week and resume work in 1 month, but when there is a residual neurological abnormality the recovery from this is of greater importance in determining the outlook than the recovery from the operation

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CHAPTER 24

VARICOSE VEINS AND LEG ULCERS

F B COCKETT

IN THE past, operations for varicose veins earned disrepute because of the high recurrence rate This is not surprising as they were undertaken without a clear understanding of the pathology and physiology of the disease and what is worse without a full knowledge of the anatomy of the superficial veins

The last 10 years have seen a considerable advance in knowledge of the physiology of venous return from the leg and the complete anatomy of the superficial veins and of the important perforating veins has been worked out It is now possible to diagnose exactly which system or combination of systems is at fault and to offer effective and safe surgery This is, of course important as the vast majority of patients present with symptoms which are fairly trivial in the first instance, their hope being that by curing the varicose veins in the early stage dangerous and painful late sequelae will be prevented This, in fact, is the ideal time for operative treatment, but it is essential to do the right operation and with technical perfection to be assured of permanent good results

Before discussing the indications for surgery the physiology of venous return and certain basic points in the anatomy are summarized and the available operations indicated

PHYSIOLOGY OF VENOUS RETURN

In the erect position venous blood from the leg is returned to the heart mainly by muscle activity The great muscles of the calf soleus and gastrocnemius are by far the most important in this respect They are ensheathed in a firm fascia and this arrangement of powerful muscles within a firm inelastic sheath forms a powerful pump referred to as the ' calf pump When the calf pump contracts venous blood is forcibly ejected inwards (to the main deep veins) and upwards the direction of flow being governed by the valves Thus when the calf pump is in action, as in walking, the pressure in the main deep veins is high showing violent fluctuations with muscular contraction (50–130 mm Hg) At the same time the pressure in the superficial veins outside the musculofascial envelope falls practically to zero In other words the superficial venous blood is cleared remarkably efficiently by muscular exercise The blood travels inwards into the muscle pump via the several perforating veins and is then pumped upwards by the muscles The whole venous flow is thus inwards and upwards

The flow inwards into the deep veins occurs only during the phase of diastole of the muscle pump During the phase of systole the blood is prevented from leaking back or being squirted back into the subcutaneous tissues by the arrangement of the valve in the perforating vein Each perforating vein is fitted with a valve which allows venous blood to flow inwards but which snaps shut when the pressure rises and prevents reflux outwards into the subcutaneous veins

If one of these valves becomes damaged then at every contraction of the calf pump a high pressure leak back into the subcutaneous veins connected with this particular perforating vein will occur causing gradual dilatation and tortuosity and so varicose veins make their appearance

ANATOMY OF THE PERFORATING VEINS

The two best known direct perforating veins are the termination of the long saphenous vein in the femoral vein at the groin and the termination of the short saphenous vein in the popliteal vein in the popliteal fossa Failure of the strategic valve at either of these two orifices leads to a high pressure leak outwards and down the vein this in turn leads to gradual retrograde dilatation first of the main vein and then of its branches Thus the picture of long saphenous or short saphenous incompetence appears—a steadily progressive condition

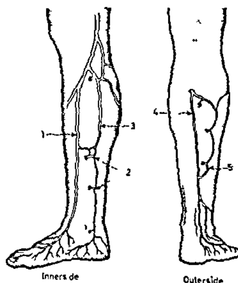


FIG 2—Anatomy of the direct ankle perforating veins (1) Long saphenous vein (2) the two main internal ankle perforating veins (3) the posterior arch branch of the long saphenous vein (usually arises about knee level) (4) short saphenous vein (5) lateral ankle perforating vein

In addition to the above are the short direct perforating veins of the ankle There are usually three on the inner aspect and one on the outer aspect (Fig 2) These short direct perforating veins open directly into the side of the main deep veins and they constitute the main venous drainage of the ankle region (the ulcer bearing area) when the patient is erect and moving It is the destruction of the valves in these veins which is most directly responsible for ulcers round the ankle

As well as these main direct perforating veins (which are relatively large and constant) there are fairly numerous small indirect communicating veins situated over the large muscle bellies of the limb These are not usually of importance in the aetiology of varicose veins

OPERATIONS ON THE VEINS OF THE LEG

In considering the operations for varicose veins it is fundamental that the aims of operative treatment should be set out clearly The first is to diagnose the point or points in the limb where a high pressure venous leak from the deep

veins is occurring, and then to stop this leak by a flush ligation of the direct perforating vein involved The second aim is to remove as much as possible of the dilated and varicose veins attached to that incompetent perforator In practice, therefore, the operations available are as follows

For long saphenous incompetence

Flush ligation of the saphenous vein where it arises from the femoral vein in the groin, then stripping of the dilated great saphenous vein from ankle to groin Separate removal or injection of some of the larger dilated branches may also be necessary in certain cases

For short saphenous incompetence

Flush ligation of the short saphenous vein where this enters the popliteal vein in the popliteal fossa, and stripping of the dilated trunk from this point to the external malleolus

For ankle perforator incompetence

Explore and divide the ankle perforating veins by a longitudinal incision The perforators may be divided just as they come through the fascia, or deep to the deep fascia If a long standing local ulcer (5 or more years) is present this is full of grossly dilated venous channels and is best excised completely Split skin is grafted to this site at a second operation

The above are three fairly standard operations However the most important requisite of successful surgery is successful diagnosis It is absolutely essential before surgery is planned that a careful clinical assessment be made of which system is at fault Thus any combination of long saphenous incompetence, short saphenous incompetence or perforator incompetence may occur

Causes of failure

The recurrences and bad results of vein surgery stem almost entirely from two sources

Failure of accurate diagnosis

When diagnosis is inaccurate a wrong or inadequate operation is performed A common example of this is operating on the long saphenous system when really the short saphenous system is at fault Or again the performance of a technically perfect high ligation and strip of an incompetent great saphenous system will not cure an ulcer or get rid of painful dilated veins round the ankle if an incompetent ankle perforating vein is left behind (because it was undiagnosed)

Failure of technical performance

The second most common cause of recurrence and bad results is failure to do a real flush ligation at the groin or popliteal fossa an absolute essential if permanent and adequate results are to be obtained

Operations on the veins are apt to be time consuming and they must be per formed with a high degree of accuracy Moreover the after treatment is important if complications are to be avoided Thus if one is not prepared to give adequate time to diagnosis full operation and adequate supervision of after treatment there will be a high proportion of recurrences and poor results

The technique of these operations and their after treatment is dealt with fully elsewhere (Dodd and Cockett 1956) and there is no place for further discussion in these pages However it may be said that if the diagnosis is accurate and adequate surgery is carried out the results are completely successful and permanent

INDICATIONS FOR OPERATION

The indications for operative treatment to varicose veins fall into four great groups (1) the presence of varicose veins causing minor symptoms such as aching and pain (2) the occurrence of phlebitis (3) eczema and (4) ulceration

The presence of varicose veins and minor symptoms

To many women the mere presence of varicose veins is offensive on account of their unsightliness Moreover as they increase in size and particularly during the time they are increasing in size they give rise to annoying aching sometimes amounting to an actual pain when the patient is standing still or doing housework Often they ache particularly just before the menstrual period

Many women present with varicose veins fearing that pregnancy will make th m much worse Others come after one or more pregnancies asking for the damage to be repaired

In the opinion of the author all the above presentations of varicose veins con stitute ad quate reason for operation if the patient is willing Varicose veins are essentially progressive and get worse as time goes on Pregnancy and jobs which entail a great deal of standing (such as that of the average housewife) make them increase quite fast There is every reason therefore in this type of case to tackle the vein by full and adequate operation at an early stage

The occurrence of phlebitis

When phlebitis occurs in part of an incompetent system of veins (that is in a branch of an incompetent long saphenous short saphenous or perforator system) this is an indication for op ration The immediate treatment is com pression of the leg with an elastic bandage and rest in elevation until operation can be arranged and performed In general the sooner a full operation can be carried out the better and any time within one week of the occurrence of the phlebitis is preferable At operation the incompetence system or systems at fault are dealt with in an absolutely routine manner with stripping and the clotted segment of vein if reasonably small is removed

This operative treatment offers the quickest and safest cure So often these patients are treated by weeks of bed rest and anticoagulant drugs When they get up the adjacent segment of vein distended with stagnant blood becomes clotted producing recurrence of thrombophlebitis Moreover there is a very real danger that the clot will spread inwards to the deep veins of the leg via the ankle perforating veins When this happens embolism may occur and the author knows of several fatalities which followed superficial venous thrombosis

Eczema

The occurrence of eczema in a limb with any type of venous incompetence is a very strong indication for dealing with the venous incompetence surgically in as radical a manner as possible Also the sooner it is done after the appearance of the first small patch of eczema the better The reason for this is twofold

First varicose eczemas can very rapidly get out of hand spread and generalize to the rest of the body Moreover, well meaning efforts at local treatment with a variety of skin applications may make it very much worse, in fact the really intractable varicose eczemas are those which have, in part become drug sensitivity eczemas The treatment of these may be a major problem and involve the patient in months or even years of skin treatment

Secondly, the non surgical method of treating venous incompetence inevitably means some form of elastic support Patients with eczema very rapidly become sensitive to the various bandages and elastic stockings, and to the applications under them They are most uncomfortable to wear on an eczematous leg and are generally undesirable

Full radical operation on the veins should therefore be advised as soon as the first indication of eczematous reaction appears and the patient will then be spared much misery and time off work.

Even a late eczema can be treated surgically with great success Provided the acute exfoliative stage of the eczema has been made quiescent by bed rest in elevation, and judicious application of cortisone ointment then full operation can be done Incisions heal perfectly well surprisingly enough through skin which has recently been red and eczematous Usually after such operation the eczema settles without further treatment

Ulceration

The threat or actual occurrence of ankle ulceration now constitutes a strong indication for operation Once again before recommending operative treatment diagnosis is of crucial importance The fact that the ulcer in question is a venous ulcer and not one of the numerous other types of ulcer occurring at this site (Cockett 1958) must first be established It must then be determined which particular set of veins is at fault

About two thirds of venous ulcers are caused by valve destruction in one or more of the direct ankle perforating veins This has usually been brought about by a previous deep thrombosis—the so called post thrombotic or post phlebitic ulcers In a minority of cases the valve destruction appears for no very obvious reason or is the aftermath of a superficial phlebitis of varicose veins which has spread down and into the perforator

In any case the operation for the cure of an ulcer nearly always requires a direct exploration and ligation of the direct ankle perforating veins as well as perhaps a full ligation and stripping of the long or short saphenous system or both

Adequate operation of this type in the early post phlebitic ulcer will forestall and prevent the very troublesome and disabling ulcers of the ankle which used to be seen in such profusion With a late or established ulcer in addition to a full operation on the veins a block excision of the ulcerated skin and split skin graft is necessary—a more time consuming procedure

It is well known that venous ulcers can be controlled and healed by either bed rest with the feet well elevated or elastic pressure bandaging with a number of special techniques Either or both of these methods is necessary as a preliminary to operation to bring the ankle skin into a fit state for operation Pressure bandaging is also a most necessary post operative procedure for patients who have had operations on ankle perforating veins

The old teaching that anybody who in the past has had a white leg or deep venous thrombosis should not have their veins operated on has now been

abandoned In fact it is in this group of patients that some of the more spectacular results of radical vein surgery are obtained It is now known that 95 per cent of all thrombosed deep veins recanalize completely in the course of time and in any case a deep venous collateral circulation is established Incompetent superficial veins and ankle perforating veins are the cause of disability in these limbs (pain ankle swelling and ulceration) and their elimination will always leave the limb better and not worse

The operations of sympathectomy and of deep vein ligation are with very rare exceptions of no use in the post phlebitic limb sympathectomy may be actively harmful (Linton 1953)

CONTRAINDICATIONS TO OPERATION

The main contraindications to operation for varicose veins and their complications are dictated by common sense They include excessive age other disabling illnesses which would make operation too dangerous and local septic skin complications On the whole there are remarkably few definite contraindications —with modern anaesthesia and correct post operative management the operations carry an extremely low risk to life and complications are few

PREGNANCY

Varicose veins when present increase alarmingly during pregnancy They usually regress to a variable extent after parturition Neither pubic varicose veins nor those on the legs should be operated on during pregnancy but should be controlled by adequate rest and elastic stockings Three months or later after d livery full radical operation should be undertaken Subsequent pregnancies can then occur without deterioration of the leg veins although the wearing of an elastic stocking throughout pregnancy should be advised

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CHAPTER 25

THE RHESUS FACTOR

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INTRODUCTION

Historical

IN 1940, Landsteiner and Weiner showed that a human corpuscular antigen present in 85 per cent of Europeans, corresponded with one found in the corpuscles of Rhesus macacus monkeys This antigen unlike the ABO antigens had no naturally occurring agglutinin or antibody Weiner and Peters (1940) showed that this Rh antigen was capable of stimulating the production of agglutinins in individuals whose erythrocytes did not contain it

Levine and his colleagues (1941) Boorman, Dodd and Mollison (1942) and Mollison (1943) showed that agglutinins against Rh antigens were the cause of many cases of the hitherto unexplained haemolytic disease of the newborn and also of serious transfusion reactions

Rh antigens

There are 6 common Rh antigens—designated by the letters C,D E c d e Other rarer antigens such as C^w D^u and e are also known Each antigen is represented by a gene on the chromosome and each person has 6 genes Thus a very large number of combinations are possible Only the D antigen is usually tested for because it is responsible alone or in combination, for most of the agglutinins of clinical importance Any person whose erythrocytes contain antigen D is said to be Rh positive and those without antigen D are said to be Rh negative In the United Kingdom 83 per cent of the population is Rh positive and 17 per cent Rh negative Those Rh positive persons whose chromosomes possess two D genes are said to be homozygous positive (DD) Those whose chromosomes possess only one D gene are said to be heterozygous positive (Dd) Any Rh negative person will have the genetic composition of dd

Rh agglutinins (or antibodies)

Agglutinins to Rh antigens are not normally present but occur as a result of iso-immunization This is the formation of antibodies by an individual against an antigen present in another individual of the same species but absent from his own body An individual can only form antibodies against an antigen which he does not himself possess

Mechanism of iso immunization

There are only two ways in which any individual can become immunized to Rh antigens subcutaneous intramuscular or intravenous injection of blood containing antigens not possessed by the individual to whom the injection is given and a pregnancy in which the foetal blood cells contain antigens which are not possessed by the mother

The capacity of an individual to form iso immune antibodies is very variable At least 50 per cent of Rh negative individuals form some iso immune antibodies to a first transfusion of Rh positive blood The size of the transfusion is of no importance but repeated injections especially if spaced over some weeks produce a high degree of immunization in most recipients (Mollison Mourant and Race 1952) Levine (1943) stated that as little as 0 67 ml of red cells if in divided doses can cause iso immunization

Disadvantages of iso immunization to Rh antigens

The major disadvantage concern young Rh negative women the majority of whom marry Rh positive men, and have Rh positive offspring in 61 per cent of their preg nancies Levine and Walker (1946) have shown that Rh positive infants born to women who have already been immunized by transfusion suffer from a severe form of haemolytic disease of the newborn many being stillborn

The second major disadvantage is concerned with transfusion In dire emergency it may not be possible to group and test for compatibility all patients requiring trans fusion The unimmunized Rh negative subject having no antibodies will suffer no immediate ill-effects but a Rh negative subject who has previously been immunized may develop a severe transfusion reaction

HAEMOLYTIC DISEASF OF THE NEWBORN

Haemolytic disease of the newborn is the result of the destruction of the foetal erythrocytes by maternal antibodies In most cases the mother is Rh negative and the foetus Rh positive but maternal antibodies to any foetal erythrocyte antigen will produce the disease Antibodies to the Rh antigens are the common est cause next are antibodies to the ABO group antigens (usually group A foetus and group O mother) and rarely antibodies to the Kell antigens

The maternal antibodies do not readily pass through the placenta before the last 3 months of pregnancy Thereafter they pass the placental barrier destroying the erythrocytes of the foetus *in utero* and causing progressive anaemia Foetal haemopoi tic activity increases to keep pace with the blood destruction and is manifested by large numbers of reticulocytes and immature nucleated erythrocytes Extramedullary haemopoiesis also occurs in the liver spleen lymph nodes thymus gland kidney and even the psoas muscle The liver may be disorganized and sometimes cirrhotic (Gilmour 1944) If haemolysis is severe the foetus may die *in utero* or be born severely anaemic and oedematous (hydrops foetalis) In less severe cases the infant is born alive and is apparently normal or only slightly anaemic Jaundice at birth is rare because the bilirubin resulting from the exces sive blood destruction is excreted via the placenta through the maternal circulation On examination these infants have a degree of splenic and hepatic enlargement which vari s with the severity of the disease and they become jaundiced in severe cases very soon after birth but in mild cases not until 18–24 hours later Any infant who becomes jaundiced in the first 24 hours after birth is probably suffering from haemolytic disease of the newborn

Haematology

All affected infants who are born alive show signs of haemolytic anaemia In mild cases the haemolysis is slight and there is only an increased reticulocyte count slightly raised serum bilirubin level and a minor degree of anaemia (haemoglobin less than 15 g per 100 ml) In more severe cases the anaemia is greater and in very severe cases the haemoglobin may be as low as 3 5 g per 100 ml with many reticulocytes and nucleated erythrocytes in the peripheral blood The anaemia is usually macrocytic There is usually a polymorphonuclear leucocytosis and there may be a few myelocytes In s vere cases the serum bilirubin level is greater than 3 mg per cent A prolonged plasma prothrombin time has been reported and this may be responsible for the haemorrhagic tendency from which these babies suffer (Dam Hanson and Plum 1939)

Kernicterus

Kernicterus arises as a result of the high serum bilirubin levels which in turn result from the excess haemolysis of erythrocytes The immature and probably damaged liver of the affected infant is unable to conjugate all the bilirubin with glucuronic acid The Van den Bergh reaction therefore remains indirect positive

The conjugated pigment gives a positive direct Van den Bergh reaction and is harmless The unconjugated bilirubin is extremely toxic especially to the nerve cells in the basal nuclei of the brain which become bile stained, degenerate and die This bile staining of the basal nuclei is known as kernicterus, and the affected infant shows irritability followed by stiffness arching of the back and extensor spasms and later spasticity of the limbs Many infants die during the first weeks of life but some survive with a variable degree of cerebral damage Such infants may be spastic and mentally retarded

It cannot be too strongly emphasized that kernicterus occurs after the child is born and should therefore be preventable Mollison and Walker (1952) showed that if the serum bilirubin level (indirect acting pigment) was not permitted to rise above 18 mg per 100 ml no cases of kernicterus occurred whereas more than 50 per cent of those with a higher level either died or survived with sequelae of kernicterus

Incidence and mortality

Approximately 17 per cent of women are Rh negative and 14 of these 17 will have Rh positive husbands of whom approximately 6 will be homozygous Rh positive and 8 heterozygous positive Therefore in 10 per cent of all pregnancies, Rh negative mothers carry Rh positive foetuses but only a very small proportion of these have manifest haemolytic disease of the newborn (*see* page 236) Haemolytic disease of the newborn occurs once in every 200–250 births (Mollison, Mourant and Race, 1952) and 10–15 per cent of affected babies are stillborn (Walker and Murray 1954)

Most foetal deaths occur after the thirty fifth week of pregnancy and deaths are rare before the twenty eighth week The death rate of infants born alive will depend on the adequacy of the care and treatment immediately after birth Walker and Mollison (1957) have calculated that it should be possible to save at least 95 per cent The mortality rate in Great Britain has declined in recent years, but in 1956 it was still 0 5 per 1 000 live births or about 10 per cent of the live born infants suffering from haemolytic disease, which is twice the mortality in the series treated by Walker and Murray

MANAGEMENT OF PREGNANCY AND LABOUR

Antenatal care

The ABO and Rh groups of all expectant mothers should be determined early normally at the time of their first visit to the antenatal clinic between the twelfth and sixteenth weeks of pregnancy The sera of all Rh negative women are tested for the presence of Rh antibodies at this time and subsequently between the thirty second and thirty fourth weeks of pregnancy The husbands of all Rh negative mothers are also ABO and Rh grouped It is unnecessary to test the sera of Rh negative women whose husbands are also Rh negative but the authors find it administratively more convenient to make no exceptions to the thirty second to thirty fourth weeks antibody test

If Rh antibodies are detected it is essential that the confinement should take place in a hospital equipped for exchange transfusions and for the specialized care that these infants require in the first few hours of life It is essential if exchange transfusion is indicated that it should be performed as soon as possible after birth Delay of even a few hours greatly increases the danger to life and the incidence of kernicterus

The authors always determine the titre of Rh antibodies If this is high (over 100), the infant is always moderately or severely affected by haemolytic disease of the newborn (Kelsall Vos and Kirk 1958) All mildly affected infants are born

to mothers with low antibody titres, but sometimes with a low titre the infant may be severely affected so that the correlation is not absolute

Premature delivery

The authors recommend premature delivery in those expectant mothers who have a history of one or more stillbirths due to haemolytic disease The induction of premature labour followed by prompt exchange transfusion will result in a higher proportion of surviving infants than can be expected if pregnancy is allowed to continue to full term (Walker and Murray 1956) Premature delivery is also recommended in those instances where maternal antibody titre is high (indirect antiglobulin titre greater than 1/256) (Kelsall Vos and Kirk 1958) Labour may be induced at any time after the thirty fourth week of pregnancy the exact time depending on the circumstances of each case However the authors prefer elective caesarean section to induction of labour so that the premature and delicate babie may be spared the risks of birth trauma made more dangerous by the marked haemorrhagic tendency which they show When premature delivery is indicated the baby is usually valuable as the mother may already have lost one or more infants and in general the prognosis for the infant is worse with increasing parity Caesarean section in skilled hands carries little risk for the mother and the risk is much less for both mother and baby in an elective operation than in one undertaken after a failed induction

Management of labour

Any expectant mother whose serum contains antibodies must be delivered in a hospital where there is the necessary Rhesus team of obstetrician paediatrician and haematologist This is essential if prompt and effective treatment is to be carried out Ideally these expectant mothers should be admitted a few days before the expected date of delivery Expectant mothers whose serum does not contain antibodies need not be delivered in hospital

The vast majority of babies with haemolytic disease of the newborn are born to Rh negative mothers but cases do occur where the mother is Rh positive or where some blood group antigen other than the Rh antigen causes iso immunization of the mother As tests for antibodies to these other antigens are not routinely performed there will be no warning of the disease prior to the birth of the child Many of them will be delivered at home and the survival of the child will depend on the early recognition of the clinical picture by the practitioner and prompt treatment in a hospital by a Rhesus team (see page 234)

A sample of cord blood is taken into a Wintrobe oxalate tube from every infant born to every Rh negative mother When the mother has no antibodies the sample is kept in the ward refrigerator for 48 hours and then discarded unless the infant becomes jaundiced or shows any evidence of haemolytic disease The sample is always available for investigation during the first 48 hours When a mother is known to have antibodies however the cord blood specimen is sent immediately to the laboratory for investigation

INVESTIGATIONS ON CORD BLOOD SPECIMENS FOR HAEMOLYTIC DISEASE

Direct antiglobulin test (Coombs test)

When fo tal erythrocytes are affected by an iso-immune antibody a thin layer of antibody derived from the globulin fraction of the mother s plasma proteins

is adsorbed and fixed on the surface of the cell When such cells are washed with saline solution and mixed with antihuman globulin (Coombs) serum they agglutinate and the strength and speed with which this occurs is proportional to the amount of antibody adsorbed on the surface of the cells that is the more antibody is adsorbed on the cell surface the stronger the agglutination and the more severely is the infant affected

Haemoglobin level and haematocrit

The haemoglobin level of the infant s cord blood is a very good index of the severity of haemolytic disease of the newborn (Mollison and Cutbush 1951) There is a relationship between the survival rate and the cord haemoglobin concentration (Armitage and Mollison 1953) but even when the cord haemoglobin is within normal range survival is not invariable Nearly all the infants with a cord haemoglobin greater than 15 g per 100 ml are very mildly affected and require no treatment The lower the haemoglobin the more severe the disease and if the cord haemoglobin is below 4 g per 100 ml survival rate is less than 5 per cent

The haematocrit is also determined to calculate the size of the exchange transfusion required in any particular case, using the nomogram prepared by Veall and Mollison (1950)

Reticulocyte and nucleated red cell count

In most severely affected infants the reticulocyte count will be high and may reach 30 per cent or more Nucleated red cells are also greatly increased and may number several thousand per c mm The reticulocyte count may be of some help in those cases with a normal haemoglobin as the reticulocytosis indicates the degree of red cell destruction

Bilirubin concentration in cord blood

Mollison and Cutbush (1951) did not find the relationship between cord bilirubin and mortality as close as that found with haemoglobin However it should always be estimated as levels raised above the normal 3 mg per cent may occur in a few cases with normal haemoglobin concentrations

TREATMENT

In about 40 per cent of infants born alive and suffering from haemolytic disease of the newborn the condition is so mild that no treatment is required (Mollison 1958) In the remaining 60 per cent treatment is an urgent necessity within the first few hours of life, and an adequate exchange transfusion performed as soon as possible after birth is the only known effective method of treatment

Exchange transfusion

The object of exchange transfusions is to replace at least 90 per cent of the infant s Rh positive erythrocytes (destined for destruction) with Rh negative cells of a compatible ABO group which will not be affected by antibodies and which will survive The infant is thereby protected from the dangers of the anaemia and the high bilirubin levels which result from the haemolysis of its own erythrocytes by the Rh antibodies

The blood used for exchange transfusion should be as fresh as possible and always less than 7 days old It may be taken into the standard acid citrate dextrose solution or into the standard bottle containing 1 000 units of heparin Citrated

blood should be concentrated to reduce the amount of citrate given to the infant and to bring the haemoglobin of the transfused blood up to approximately 15 g pe 100 ml or the haematocrit to 50 per cent The haemoglobin level of citrated blood is approximately 11–12 g per 100 ml

The authors always use the nomogram of Veall and Mollison (1950) to calculate the number of exchanges and the transfusion required to correct the anaemia Walker and Neligan (1955) recommended using 80 ml per pound weight of the infant

A polythene catheter connected to the exchange syringe is passed via the umbilical vein until a free flow of blood is obtained The venous pressure is determined by disconnecting the catheter and noting the height of the column of blood The normal venous pressure in the umbilical vein is 6 cm of blood at the level of the xiphoid cartilage (Diamond Allen and Thomas 1951) and higher figures indicate congestive heart failure

Twenty ml of blood is then withdrawn from the infant and discarded If a rai ed umbilical venous pressure is found it may be wise to remove 40 ml of blood before the first injection Twenty ml of the donor blood is injected slowly (1–2 minutes per injection) and this sequence is repeated until the calculated total has been given The blood should be warmed to at least 30°C and the infant must never be allowed to become chilled during the exchange Calcium gluconate 1 ml of a 10 per cent solution is injected through the catheter after every 100 ml of transfused blood to maintain the ionized serum calcium within normal limits as calcium is fixed by the transfused citrate

The bilirubin concentration is determined on the last sample withdrawn and thereafter 6 or 12 hourly for the first 2–3 days or even longer in the case of premature infants

If the bilirubin concentration continues to rise a further exchange transfusion is carried out before the level exceeds 20 mg per 100 ml The object of this second exchange transfusion is to remove as much bilirubin as possible from the infant s circulation Rh negative blood of compatible ABO group is again used and the transfusion continued until about 100 ml per pound weight of the infant have been exchanged Provided the bilirubin level is kept below 20 mg per 100 ml kernicterus does not occur

I di ations for exchange transfusion

Mollison (1956) gave the following indications for exchange transfusion

(1) Cord haemoglobin less than 15 g per 100 ml

(2) All infants weighing less than 5 pounds or born more than 3 weeks b fore term In addition the present authors exchange transfuse in the following cases

(3) Any affected infant born to a mother who has had a previous child affected with haemolytic disease

(4) Those infants with cord haemoglobin over 15 g but whose serum bilirubin exceeds 3 mg per 100 ml

Exchange transfusion if it is to be fully effective must be carried out within a few hours of birth It is still worth doing even in those infants in whom diagnosis is delayed until after the first day or two of life although it will be less beneficial

Breast feeding

The advantage of breast feeding for these infants is obvious and it may be permitted for although Rh antibodies can be demonstrated in breast milk it is not likely that these are absorbed from the gut

PROGNOSIS

Prognosis for affected infants

In 40 per cent of cases the haemolytic disease of the newborn is so mild that the infant requires no treatment and complete recovery rapidly follows a short period of slight jaundice In the remaining 60 per cent prompt and adequate treatment should result in the survival of at least 90 per cent of the infants (Walker and Mollison 1957) and 99 per cent of these survivors should not suffer any permanent ill effects

It is essential to examine these infants at regular intervals during the first few months of life as they may become anaemic and require one or more simple transfusions This 'late anaemia' is a temporary phase and the infants soon recover During the first few years of life examination should be directed to the detection of minor degrees of cerebral palsy mental retardation or deafness so that early remedial measures can be taken Given prompt and adequate treatment even severely affected infants will develop normally

Prognosis for future infants where the mother is Rh-negative

If the previous baby born was normal 97 7 per cent of the mothers will have a normal baby at their next pregnancy (Boorman 1954)

If the previous baby suffered from haemolytic disease of the newborn then future Rh positive infants will suffer from haemolytic disease Whilst there is no doubt that the disease tends to get worse with increasing parity of the mother (Walker and Murray 1956) the pattern is not uniform for all families These authors found the following patterns

(1) If the previous infant was mildly affected and did not require treatment then 96 per cent of subsequent babies were born alive, 60 per cent were mildly affected and recovered without treatment while the remaining 40 per cent required treatment but had an excellent chance of survival

(2) If the previous infant required treatment but the disease was of moderate severity (cord haemoglobin 12–14 8 g per 100 ml) there was an 80 per cent chance of a live born infant and most of these babies survived after treatment If the previous baby was severely affected (cord haemoglobin 9–12 g per 100 ml) stillbirth rate was approximately 25 per cent, and in very severe cases risk of stillbirth was 50 per cent In these cases the live born children were severely affected and prognosis was not good

(3) If the previous baby was stillborn owing to haemolytic disease 80 per cent of later infants were also stillborn if pregnancy was allowed to proceed to full time

If the husband is heterozygous then there is a 50 per cent chance that a future infant will be Rh negative and not suffer haemolytic disease

Prognosis in relation to marriage

Some engaged couples consult their doctors before marriage In some cases the woman wishes to know her Rh group and what the prospects are of producing an affected child if the man is Rh positive As a result of publications in the lay and medical press an unnecessarily gloomy view of their prospects is usually given The following statistics were taken from the results of pregnancy in 10 000 Rh negative women published by Boorman (1954)

In the first pregnancy approximately 0 17 per cent produced an affected child provided the woman had not had a previous transfusion or injection of Rh positive

blood but the disease was very mild and required no treatment In the second pregnancy approximately 3 3 per cent produced an affected child in the third pregnancy approximately 5 8 per cent in the fourth pregnancy approximately 8 per cent in the fifth pregnancy approximately 10 per cent After the fifth child approximately 15 per cent produced affected children

Certain factors will modify these figures If the husband is heterozygous positive about 50 per cent of the children born may be Rh negative and the chances of an affected infant will be reduced If the husband is homozygous positive the chances will be increased If the woman has had a previous injection of Rh positive blood the chances will be substantially greater

It should be emphasized to the mother that more than 90 per cent of the infants born alive and suffering from haemolytic disease of the newborn survive and develop normally provided that prompt and adequate treatment is given as soon as possible after birth in a fully equipped and staffed hospital

SUMMARY

The Rh and ABO groups of every expectant mother must be ascertained

All Rh negative expectant mothers should be tested for the presence of antibodies at 32–36 weeks of pregnancy

Any expectant mother who has antibodies in her serum must be confined in a hospital equipped and staffed for exchange transfusion

Any infant becoming jaundiced in the first 24 hours after birth is suffering from haemolytic disease of the newborn and must be exchange transfused as soon as possible The risk of death or residual brain damage increases with every hour of delay in providing adequate treatment

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CHAPTER 26

THE NODULAR BREAST

R. S HANDLEY

THE nodular breast is one in which palpation of its substance by the flat of the fronts of the examiner s fingers gives a sensation of fine granularity nodularity or even lumpiness A definite lump which immediately and unmistakably presents itself as a mass different from the re t of the breast tissue—often termed in American literature a dominant lump —is another and in many ways more straightforward problem which will need a prompt surgical opinion and will almost always require some form of excision Though it is not the primary purpose of this chapter to consider dominant lumps or their treatment it must be acknowledged that it is sometimes very difficult for the doctor to decide whether what he feels should be regarded as a lump or merely nodularity Experience though it makes this difficulty less frequent never altogether abolishes it and when doubt remains it is foolish to procrastinate a second opinion should be sought without delay

Anatomically the breast is a nodular structure It is protected and packed in fat most of which lies in front of the secretory tissue and to some extent masks it from the examining hand Physiologically the breast is in a constant state of change during the reproductive period of every woman s life Each month a rising tide of blood nourishes its increasing cellular activity and each month these elaborate preparations are almost always disappointed

NORMAL NODULARITY

It is perhaps surprising that the breast does not give more trouble than it does but discomfort a sense of fullness and increased nodularity in the days immediately preceding the period are accepted by large numbers of women as a normal part of their lives If the same breast is examined a week after the period has finished and again two days before its onset a noticeable increase in nodularity at the latter time can often be felt especially in those breasts which suffer premenstrual discomfort Nodularity in any breast reaches its zenith during lactation Nodularity must therefore be accepted as a normal condition particularly in thin people and particularly in the upper half where the covering of fat is thinner

The breast is seldom examined with any care except when it is causing symptoms It is therefore difficult for most medical men to establish in their minds a standard of normality In an organ which is in a constant state of change normality is not a fixed point but a range and it is always difficult to recognize a range of normality without constant practice in the clinical examination of the normal It thus happens that in a breast which is causing marked discomfort or pain areas of nodularity are considered pathological when in fact they are within the range of normal This situation has been further confused by nomenclature normal nodularity having been called by various names according to the speculations on its pathology which happened to be fashionable It

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Nor does nodularity explain the presence of skin dimples nipple discharges or stony hard enlargement of axillary lymph nodes All these signs are likely to be due to a much more sinister cause and demand a surgical opinion

The carpet bag term chronic mastitis has often been used to include three conditions which have a pathological status in their own right These conditions are cystic disease duct stasis and chronic infection and they require brief consideration

Cystic disease

The aging breast has a strong tendency to form small cysts Post mortem examination shows that cysts which have never given rise to symptoms or signs are present in the breast at death more often than not Their frequency would support the contention that they are normal in old age Small cysts also occur fairly frequently during the years preceding the menopause Although they may add to the nodularity of a breast they are not responsible for the great majority of nodular painful breasts It is only when a cyst reaches a sufficient size to be palpable as a definite lump or when a number of small cysts is so closely grouped together in an area of breast tissue as to form a lump that a clinical diagnosis of cystic disease is justifiable—a diagnosis which must be confirmed either by biopsy or when all the clinical features of a cystic swelling are present by aspiration A final diagnosis of cystic disease should in fact only be made on pathological evidence

Duct stasis (mammary duct ectasia)

It is common in post mortem examinations to find the main breast ducts beneath the areola and nipple distended by yellow brown or even green material which resembles pus and is composed of the desquamated remains of epithelium This change ultimately occurs in about 25 per cent of all female breasts and it can only be regarded as a disease when it gives rise to complications It may cause nodularity in the region of the nipple and in extreme form the distended ducts give rise to palpable radiating worm like structures under the areola to constitute the so-called varicocele tumour of the nipple Distended ducts may give rise to anxiety and require exploration because they are felt as a small but definite lump

The three complications of duct stasis are rupture of a duct excessive fibrosis round the ducts and nipple discharge Rupture of a duct results in the discharge of its contents into the tissues with the production of a foreign body reaction This is at times so vigorous that it simulates an abscess If the abscess is incised it is found to be solid and its predominant histological features are small round cells plasma cells and foreign body giant cells These appearances have sometimes been termed plasma cell mastitis Excessive fibrosis is sometimes the result of irritation of the duct walls by their structureless contents or of a slow leakage This may cause retraction of the nipple and occasions anxiety because the presence of a central carcinoma is feared In cases of doubt only a biopsy can settle the question The third complication to which duct stasis gives rise is nipple discharge this is discussed in the succeeding chapter

Chronic infection

Chronic infection of the breast is the only condition which might truly be described as chronic mastitis It is uncommon it causes a definite lump in the breast and thus requires only the briefest mention here Chronic infection is due

would perhaps be useful at this point to consider the matter of nomenclature

NOMENCLATURE

The most commonly used term to describe nodularity is ' chronic mastitis , and patients are constantly being told that they suffer from this condition It is, however universally recognized that nodularity, whether it is conceded that it is normal or not, is certainly not due to inflammation ' mastitis ' is therefore a misnomer Cheatle and Cutler (1931) recognized this when they coined the term " mazoplasia for uncomfortable nodularity They stated that the clinical features of mazoplasia were diffuse pain increased density of the breast substance and fine nodularity, and they acknowledged that mazoplasia appeared to be more a physiological than a pathological state They were also in some difficulty over the histological appearances of mazoplasia because they recognized them to be present in some part of the breasts of most women between the ages of 30 years and the menopause The term fibroadenosis has more recently been suggested by Atkins (1947) to include ' a painful or nodular condition of the breast not due to new growth bacterial inflammation, or fat necrosis This term is less open to objection because it is generally recognized that increasing fibrosis in the aging breast is normal but the use of special terms implies a change which is pathological

The only symptom to which the nodular breast ever gives rise is discomfort or pain Routine examination of the breasts in all patients would however, show that the majority of nodular breasts are not painful Patients are also seen in whom breast pain is not accompanied by nodularity Though engorgement of the breast by the normal hormone flux aided in some people by vigorous use of the pectoralis muscles may produce both nodularity and tenderness the sign and the symptom are not necessarily associated It would seem that the three terms " nodular painful breast nodular breast and painful breast adequately cover the clinical states found and in using them we do not commit ourselves to special words which imply a greater understanding than we in fact possess In so far as pain in the breast is not a normal condition the word ' mastodynia is an admissible (but perhaps unnecessary) term to describe the painful breast

CLINICAL PICTURE

Clinically nodularity in the breast whether accompanied by pain or not is usually bilateral but is more obvious—sometimes much more so—on one side than the other Lymph nodes are often palpated in the axilla more easily on the more affected side and they may be tender This enlargement and occasional tenderness of the nodes are presumably caused by the increased flow of lymph from a congested breast The consistency of the lymph nodes may be difficult to gauge especially in the obese but if they feel hard they must be viewed with suspicion even in the absence of a definite lump in the breast

A rare pitfall which requires specific mention is the nodularity enlargement and thickening of a sharply demarcated sector shaped area in an otherwise normal breast It is caused by intraduct carcinoma Because of its regular sector like shape it may be mistaken for benign nodularity limited to a lobe and the situation is not then treated with the urgency which it demands

Nodularity may of course occur in a breast which harbours an impalpable carcinoma This is rare but it must be emphasized that nodularity will not account for eczema of the nipple or areola or for nipple deviation and retraction

The use of x ray therapy for the nodular painful breast was also advocated at one time and it is only mentioned to be condemned as dangerous

The only effective drug which will decrease breast congestion and aching is testost rore It is unjustifiable to use it except in the severest cases because of its defeminizing effects

There is no evidence to show that nodularity and pain render the breast more liable to develop carcinoma Such studies as have been made on the liability of benign conditions to precede carcinoma indicate that the incidence of carcinoma in breasts which have suffered from fibroadenomas cystic disease or duct papil lomas is about twice what is to be expected in the general population but this small increase in pathologically proven benign disease has not been shown to include clinical nodularity or pain Nevertheless the nodular breast is certainly not immune from the general incidence of breast cancer A woman who has been reassured once about her breast may be less inclined to notice the appearance of a lump or to seek further advice about what may appear to her a mere extension of what she has been told is harmless The doctor when he assures a patient that her nodular breast is innocuous should stress that he does not consider the *consultation* to be a waste of his time that on the contrary the patient has been wise to seek advice about symptoms which she did not understand and that she must come again if she is worried or notices new symptoms in her breast Some women ask for routine visits for a check up of their breasts To be useful in the detection of early cancer a check up would be needed every 3 months and this besides inflicting the burden of countless normal examinations on the doctor might well do the patient more psychological harm than physical good In gen er.l ther fore the routine visit is best avoided

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either to the tubercle bacillus when it is secondary more often than primary and tracks into the breast from a neighbouring caseous lymph node, or it is caused by non specific infection of a duct and is almost always seen in women with indrawn nipples It gives rise to recurring abscesses close to the areola and has been discussed by Atkins (1955) under the designation of mammillary fistula It requires surgical management

TREATMENT

It must seem that we have hitherto been largely engaged in defining what we are discussing and in clearing away the undergrowth of nomenclature The concrete problem now remains of what to do about the nodular painful breast

If a definite lump is discovered in the breast the course of action is clear It should usually be excised but it may—if it shows all the clinical signs of a cyst—be aspirated

Even the most experienced examiners may sometimes be left in doubt as to whether or not there is a lump present The predicament may sometimes be resolved by a second examination of the breast a fortnight later, when the patient will be at the opposite pole of her menstrual cycle If doubt still remains the area should be regarded as a lump and the advice of a surgeon promptly sought

The breast which is nodular but neither painful nor the seat of a lump does not require any treatment at all

The painful breast and the painful nodular breast do require treatment but surgery has no part to play in it The first step is an examination which shall not only be careful but shall seem to the patient to be careful It should be followed by a categorical reassurance that no structural abnormality is to be found It is then necessary to consider the psychological factors which have aggravated the aching and tenderness of congestion into actual pain and this task may require delicacy time and patience In the words of Patey (1951) when organic disease has been excluded it is important that the patient shall be completely satisfied on this point It is often wise and necessary to explain to the patient the frequency and nature of physiological lumpiness of the breast and the susceptibility of the breast to pain If this attitude is adopted a high proportion of cases of breast pain can be cured or brought under satisfactory control in contrast to the condition of affairs when a hedge diagnosis of chronic mastitis is made which by impressing on the patient's mind the existence of an organic disease of the breast often fixes the pain there all the more firmly

It is surprising how often quite early in the explanation of the possible effects of worry on an aching breast it will emerge that the patient has been afraid that she has a breast cancer If she accepts a categorical reassurance on this point her pain will almost certainly cease to worry her Premenstrual aching and tenderness will of course continue but they are no longer a source of fear and they may be alleviated by simple advice about the use of a comfortable and well fitting brassiere Vigorous use of the pectoralis major muscle in the premenstrual week also increases vascularity, and violent exercise or heavy housework is therefore best avoided The belladonna plaster, which used to be popular was perhaps useful as a physical support which tended to keep the breast still but it must also have been a psychological prop of value—it could not have had a pharmacological effect

Leborgne (1953) who has published some beautiful mammograms demonstrating duct papillomas and other lesions If this method were to become of practical service in the investigation of nipple discharge it would need a great deal more practice than its highly exacting technique has hitherto received, many of those who have attempted it have thought it more trouble than it was worth

CAUSAL CONDITIONS

Carcinoma of the breast

The commonest cause of a nipple discharge is breast carcinoma but the discharge is *seldom* of great diagnostic importance because other and more reliable signs of malignant disease are also present The author s series of some 400 cases of breast carcinoma provides only one instance of a discharge being the only sign to indicate malignant disease Both scirrhous and intraduct carcinoma may give rise to discharges the former usually thick yellow or serous and the latter blood stained

Intraduct papilloma

Intraduct papilloma is the next most frequent cause of nipple discharge In contrast to what holds for carcinoma, discharge is usually the only sign of a duct papilloma Duct papillomas are not common and though the great majority of cases show a discharge their rarity makes them a less common cause than carcinoma The majority of discharges from duct papillomas are blood stained but they may be serous S rous and blood-stained discharges may alternate

Duct stasis

Duct stasis is the third common cause of nipple discharge This condition is not widely recognized as an entity afflicting the breast after the menopause but its feature have already been briefly considered in the previous chapter The discharges produced are of the thick coloured variety and vary from yellow to dark brown or black and sometimes contain blood Serous discharges are also occasionally seen

Epitheliosis

Epitheliosis is the last cause of discharge which needs to be considered Epitheliosis is akin to duct papilloma and is evidence of atypical though still benign epithelial hyperplasia Like duct papilloma it is only discovered if it gives rise to nipple discharge or if it is accidentally uncovered by the histological examination of a biopsy specimen The discharges from epitheliosis are mainly blood stained but occasionally serous or thick The importance of epitheliosis lies in its potentiality as a precursor of malignant change

The Table prepared in 1956 by the author s senior registrar A W Nurick and hitherto unpublished gives the incidence and cause of cases of nipple discharge under the author s care at the Middlesex Hospital London in the preceding 7 years Its findings correspond reasonably closely with similar American figures

TREATMENT

It has already been said that milky discharges can be ignored All other nipple discharges require a serious attempt at elucidation and this usually entails a biopsy through a periareolar incision Where obvious signs of co-existent carcinoma are present investigation of a nipple discharge is obviously irrelevant

CHAPTER 27

DISCHARGE FROM THE NIPPLE

R S HANDLEY

IT is surprising that the normal breast does not discharge fluid except under the stimulus of pregnancy It is possible that minute amounts of fluid do escape and dry up and are then brushed away by the clothing More probably the keratinous plugs which fill the duct openings in the non lactating breast act as complete corks The symptom of nipple discharge is thus interesting from its rarity and also because its elucidation and treatment may prove very difficult

Discharges from the nipple may be divided according to their appearance into four categories (1) milky discharges (2) serous discharges (3) thick coloured discharges free from blood and (4) blood containing discharges

Milky discharges

Discharges which resemble milk are in fact, milk and can be disregarded They are uncommon but some women may continue to produce small quantities of milk for years after finishing lactation Rarely, women who have never lactated and who deny ever having been pregnant show a slight milky discharge

Serous discharges

Serous discharges as their name implies resemble serum They generally indicate epithelial overactivity whether benign or malignant

Thick coloured discharges

The thick coloured discharges which do not contain blood may be of differing colours They are sometimes creamy white but more often yellow they may be dark brown *(suggesting that they contain blood)* or even green It is not possible to say from inspection whether blood is present in the darker varieties and only chemical testing will settle this point

Blood-containing discharges

Blood containing discharges may be of bright and obvious blood more often the blood is dark Patients with dark brown discharge may be misled into stating that it is blood stained when the orthotoluidine test proves negative

INVESTIGATIONS

It is unfortunate that the last three types of discharge do not have an unequivocal diagnostic significance They are however more useful as guides to the under lying pathology than no guides at all Similarly the cytology of smears of a discharge is of uncertain help partly because characteristic cells may fail to emerge at the appropriate time and partly because pathologists have small opportunity for examining such smears Radiological investigations of the breast after the injection of opaque media into the ducts has been advocated particularly by

be very rare to encounter cases in which the investigations advocated have not yielded the answer

The biopsy which provides the diagnosis is also the treatment for benign single papillomas their relatively innocuous nature does not require a mastectomy If unsuspected carcinoma is revealed it will be treated *secundum artem* Duct stasis once diagnosed does not require treatment unless it is a nuisance because of profuse discharge or complications and the former will usually have been largely abolished by the biopsy removal of the most profusely discharging duct If annoying discharge persists after biopsy the operation of subareolar excision of all the ducts beneath the nipple together with surrounding tissue in the central area of the breast will safely abolish symptoms without mutilation in those patients who will not again become pregnant The technique is described by Haagensen (1951) The most difficult decision comes when a biopsy for nipple discharge reveals the atypical but benign epithelial hyperplasia usually called epitheliosis in Great Britain Whether a prophylactic simple mastectomy should be performed or not depends on the pathologist s opinion The modern pathologist regards epitheliosis with more equanimity than his predecessors and considers the onset of malignant change as likely only when hyperchromatism mitotic figures and so forth are seen in his sections

In conclusion it must be emphasized that a nipple discharge is not a symptom to be lightly brushed aside Though its cause is usually benign it may occasionally be the only indication of serious breast disease

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The prime consideration in performing a biopsy for nipple discharge is to decide the location from which it comes This is often known to the patient who has discovered an area in her breast where pressure provokes the discharge If such a pressure point is unknown to the patient it can often be discovered be firm pressure with the tip of the finger If no point can be found to yield discharge on pressure the position of the duct which is discharging can sometimes be recognized by inspection of the nipple, and this will indicate from what quadrant of the breast the discharge is coming

When the source of a discharge can thus be accurately or approximately localized, a periareolar incision traversing perhaps one third of the circumference of the areola is made and is deepened by dainty dissection to expose the underlying ducts The duct responsible for the discharge will usually be seen to be distended and is easy to recognize if it contains dark discharge It is followed towards the

TABLE

CAUSES OF NIPPLE DISCHARGE IN 443 CASES OF BREAST DISEASE

Disease	*Number of cases*	*Number with nipple discharge*	*Percentage with nipple discharge*
Carcinoma Intraduct Other types	10 220 } 230	5 10 } 15	50 4 5 } 6 5
Duct papilloma	13	11	85
Duct stasis	12	9	75
Epitheliosis	15	6	40
Fibroadenoma	59	0	—
Cystic disease	76	0	—
Miscellaneous (cause of discharge not determined)	38	3	7 5
Total	443	44	10

circumference of the breast, the periareolar incision if necessary being extended in a T form It is then excised and the elongated wedge of tissue removed will yield its secret to microscopic if not to naked eye inspection Duct papillomas in particular can often be well seen by this technique because they cause a fusiform swelling in the duct It is needless to add that meticulous haemostasis is needed in order that the surgeon may see the small structures with which he is dealing A periareolar incision if carefully sutured becomes literally invisible

The real difficulty comes when the source of a duct discharge cannot even approximately be localized Under these circumstances it is the author s custom to re examine the patient two or three times at short intervals and if no further information is obtained to watch her if she is under the age of 35 or 40 years Above this age a periareolar incision is made opposite the upper outer quadrant and the accessible ducts inspected If no useful information is thus obtained if the patient is over the age of 50 years and if she believes the discharge is blood containing a simple mastectomy is the safest course to adopt even though it is not universally agreed that such drastic treatment is necessary It will in any case

when the Greeks, in Sir Kenneth Clarke s phrase invented the nude Glances at statues in Lahore temples or at classical Chinese drawings provide evidence if evidence were needed that bulky and pendulous bosoms are considered objects of beauty by other races

We are concerned here with the reasonable psychological indications for the operation in Great Britain today It is quite impossible to exaggerate the feelings of inferiority and the distress that many girls endure throughout their teens and twenties and even their whole life because of their belief that their breasts are big pendulous and otherwise ugly or because of the manifest fact that they are flat chested with inadequate breast form The writer holds these feelings to be realistic and to provide an entirely adequate indication for surgery A girl s feelings about her breasts are involved in her reactions to the opposite sex as was illustrated by one patient who said that she felt she must have the operation because she would never get married in her present condition as men are so breast conscious another patient said that she had never for many years of married life undressed in front of her husband or gone to bed with him without wearing a brassière A girl who has either a really bulky dependent bosom or a flat che t also extends her shyness and unhappiness about it to her relationship with her own sex Such girls may have the greatest reluctance to undress even in front of other women This reluctance is particularly acute on occasions such as bathing and often leads to complete abandonment of what would otherwise be a happy recreation The general reaction of a girl with a bulky bosom is to make her f el that she is different from other girls and handicapped not only in matters of sexual importance but in looking attractive and smart in her ordinary dresses

These psychological disadvantages can be major handicaps and they cannot be ignored in modern medicine not all of us are robust and well adapted types A girl with bulky dependent bosoms not infrequently attributes misfortunes both in love and in economic life to her faulty breast shape and the intensity of these feelings is very seldom apparent to her family or to her general practitioner

Organic indications

Under the heading of organic indications come such factors as reduction in weight relief of intertrigo relief of painful cystic breasts, relief of neck and shoulder pain and relief from the constant expense of having to provide special brassieres and of being unable to obtain ready made clothes which fit and hence being able to look smart while still paying basic prices

The writer has reduced breasts by as much as 6 pounds on each side It is clear that to carry such an enormous weight on the shoulders day in and day out is virtually an orthopaedic handicap Severe shoulder pains caused by excess of breast weight can simulate a brachial neuritis Such bulky breasts lactate poorly In Sweden it is not uncommon for patients to be referred from the obstetric depart ment to the plastic department for breast reduction and elevation in order that they may lactate better

Submammary intertrigo can be a major and quite untreatable ailment for women with dependent breasts who live in the tropics It can be entirely relieved by an appropriate mammaplasty

It is also a fact that mammaplasty has an important role in the surgical treatment of obesity A further indication related to the surgical treatment of this condition is the association of incipient cardiac disease The late Milton Adams of Memphis Tennessee stated that a large number of his patients came from the cardiac

CHAPTER 28

MAMMAPLASTY

PATRICK CLARKSON

IT is now 300 years since Durston first operated for "prodigious bigness' of the breast and 50 years since Moriston and Lexer established the principles of the two operations most widely used for this purpose in modern surgery Yet in Great Britain, both ignorance of and even hostility to the idea of the operation remains prevalent This perhaps is understandable when we remember that 'th organ of lactation is in truth both a fact and a symbol As Malinlac (1950) pointed out its function in maternity its sexual role its religious significance in different cultures, have had a profound influence on art folklore and customs' The folklore and religious beliefs of every race show evidence of the influence of man s attitude towards the breast The Christians have their St Agatha the patron saint of breasts who amputated her own to escape the pursuit of the lecherous Quintianus In New Guinea the Sinangolos tribe are said to believe that concep tion takes place through this organ Although utilitarian modifications of the breasts such as the unilateral amputations by the Amazons, and the elongation of the breasts by Basuto mothers have been practised throughout history, it is understandable that surgical interference with the breast for the purpose of improv ing its shape and pleasing the vanity of women should meet with opposition This today is most prevalent amongst those of simpler religious beliefs and education

It is the writer s firm view that far too few women in Great Britain who need the operation are allowed to seek it by their family or by their practitioners Never theless the number of patients who come to mammaplasty today—for psycho logical or for organic indications—is steadily increasing There are of course both class and economic factors in the distribution of patients What is a serious social, economic and psychological handicap to a city woman in the professional class, may well be nothing of the sort to one of a more peasant occupation and background

INDICATIONS FOR MAMMAPLASTY

Psychological indications

Psychological indications vary not only from patient to patient but from surgeon to surgeon, and there are the widest possible national variations in opinion about what constitutes an aesthetically desirable shape and size of the breast It was Malinlac again who reminded us that one of the earliest known pieces of sculpture the Venus of Laussel found in Styria and dating from palaeolithic times, shows a corpulent lady with heavy pendulous breasts It is reasonable to argue that the artist who made her statue regarded her breasts as comely and aesthetically satis fying Her figure is in contrast to that of the Venus de Milo, whose breasts conform to the classical Western European ideal Indeed it is possible to claim that Western European man has been in a mental straitjacket since the fifth century B C

As Clarke (1956) pointed out in Vitruvian man the space between the two nipples was equal to the distance between the lower part of the breast and the umbilicus and also equal to the distance between the umbilicus and the gap between the legs But unhappily it must be emphasized that the majority of patients coming for this treatment provide little stimulus for the higher flights of aesthetic surgery

Free graft of the nipple

It was Lexer who 50 years ago introduced the idea of areolar transplants after resection of excess breast tissue Thorek (1939) showed that the complete nipple could be transposed successfully The nipple and areola with a diameter of about 1½ inches are excised A site generally 7½–8 inches from the suprasternal notch and 4½ inches from the midline is prepared by dissecting the epidermis from a circular area The free nipple graft is then placed upon a uniform richly vascular bed of dermis In the writer s experience it is the most consistently successful free graft in surgery The erectile power is retained Some return of sensibility to light touch can be expected though not full erotic sensibility The operation is generally accompanied by much less blood loss than the Biesenberger type of repair and in almost all cases can be completed in 1 hour or at the most 1½ hours As much breast tissue as desired can be removed in one stage Enough breast parenchyma is left to form a small but comely breast promontory It should however be noted that some patients with the most bulky breasts have come to loathe their breasts and are quite explicit that what they want from operation is a flat chest with retention of the nipple Only a method with a free graft of the nipple is available for them

COMPLICATIONS IN MAMMAPLASTIC OPERATIONS

The early and somewhat common complications associated with mammaplastic operations are haematoma and as a consequence or independently necrosis of inferior portions of the flaps Haematoma is a risk which can also threaten the life of a nipple It is unquestionable that the best rule of management when a haematoma is found or thought to be present is to return the patient to the theatre give a general anaesthetic open up the wound evacuate the haematoma and secure the bleeding points

Necrosis of the nipple

Necrosis of the nipple is a recognized risk of all Biesenberger and flap type operations It is this risk which led Ragnell (1946) to insist upon the necessity for a two stage operation for bulky cases It must also be said that the more forward the projection of the breast which the surgeon obtains the firmer the breast and the more closely the breast form is made to approximate to the aesthetic ideal the greater the risk of necrosis If the surgeon and patient are content with a gently dependent breast the risk is small In over 100 breast reductions 2 nipples have been lost Loss of the nipple in these Biesenberger type operations is generally put at 2–5 per cent of cases It is of course a tragedy but much can be done to remedy it The method of reconstruction favoured by the writer is that of a free graft of pigmented vulval skin as described by Milton Adams (1949)

Loss of sensation of the nipple

The element of sensation which is most likely to be lost following a breast reduction is that of erotic sensibility It is clearly a matter of no importance to

department For these patients he did a very radical one stage reduction with free graft of the nipple—an operation which is much more rapidly performed and with much less stress to the patient than other types of mammaplasty

A patient with diffuse cystic mastitis which fails to respond to other treatment can be treated by excision of total breast parenchyma but retention of the nipple as a free graft is possible, thus relieving the woman of her pain without sacrificing her nipples

Reduction of the contralateral breast after radical mastectomy

If after a radical mastectomy, the remaining breast is bulky and dependent, it can produce a lop-sidedness which is very distressing to the patient causing much awkwardness and difficulty A radical reduction of this breast by the free graft method adds greatly to her comfort and ease and makes the fitting of brassieres and the symmetry of appearance in dress altogether better

Unilateral reconstruction of the breast promontory

Gillies (1945) has shown that satisfactory reconstructions of the breast promontory can be done for congenital absence or after radical mastectomy, though no such surgery should be contemplated for about 3 years after the resection The importance of this operation lies in the enormous solace that knowledge of it can give to a young woman who has just had a radical mastectomy If she is told in the early stages after operation that in due course a restoration of the breast promontory is practicable she can be substantially relieved of the feelings of mutilation which so often afflict young married women who have this tragic cancer

CHOICE OF OPERATION FOR BULKY BREASTS

There is a choice of two methods for the operative correction of bulky and pendulous breasts (1) The operation in which the nipple is borne on a flap of breast parenchyma as in the Biesenberger (1935) type, and (2) the one in which the nipple is transposed as a free graft (Thorek 1939)

The Biesenberger type of operation

The Biesenberger operation is an improvement on the techniques introduced by Morestin about the turn of the century Its advantage is that the nipple carries with it, or can carry with it an intact nerve supply and of course is supplied with ducts leading to breast parenchyma

This type of operation gives the best breast form and has the greater chance of retaining full nipple sensation It also permits the possibility of subsequent lactation (although only the occasional patient who has a mammaplasty wants to suckle any future child) Operations of the Biesenberger type should be reserved for moderate degrees of dependency and used only for those in whom the nipples have not descended more than 3 inches below the normal level that is the nipples are not more than 10–11 inches from the suprasternal notch If the method is used for breasts with greater degrees of dependency the operation must be done in two stages An attempt to do a major reduction by an operation of the Biesenberger type in one stage is very likely to result in necrosis of the nipple

At operation the new site to be chosen for the nipple clearly depends upon the proportions of the patient For most it can reasonably be placed at the level of the midpoint between the acromion and the lateral epicondyle of the humerus

major is well tolerated by the tissues The suggestion that it might be a carcinogen is apparently without foundation The writer has used these implants on occasion and there is no doubt whatsoever that from a sculptural point of view the surgeon can produce with them a very beautiful forward standing breast on what was formerly a flat chest Clearly the use of Ivalon must be restricted while evidence is accumulated of its long term effects in the body It should be used only after explaining to the patient that it may possibly be rejected early and secondly that its effect in the body for longer than 10 years is not known It gives a very firm consistency to the breast

GENERAL STANDARD OF RESULT IN MAMMAPLASTY

A patient who has had a breast reduction by whatever method tends to be exceptionally satisfied Dissatisfaction is only seen among those who have had a major complication which has not been corrected Despite the satisfaction which most patients feel it must be admitted that the general aesthetic standard of result is not exciting Most breasts after reduction could be described as comely in a general sense rather than ideal It is possible however if the patient so wishes it at a slight but definite increase of risk of necrosis of the nipple to obtain a most forward standing full trim elegant and virgin type breast—one which conforms to the ideal fixed in the mind of Western European man The request for such a type of breast is not often made Most patients are bent only upon getting relief from the affliction of bulky heavy and dependent bosoms

CONCLUSIONS

The operations for breast reduction and for the correction of a flat chest are part of modern life and have come to stay Breasts come in many shapes and sizes and a large and increasing number of women are dissatisfied with what they have got However much we may criticize the desire to have a breast form which conforms to a generally accepted aesthetic pattern it has to be accepted that gross variations from this form can be a severe handicap to the whole emotional and personal life of a modern girl It is entirely reasonable and proper medicine that such feelings should be offered relief by surgery quite apart from the considerable relief of organic symptoms due to the weight pain in the shoulders intertrigo mechanical interference in many recreations and the expense and unsuitability of the special clothing needed which the operation affords The price in terms of incapacity (about one month) and of the scarring (relatively unimportant) is a small one to pay

Although, in general preference is for the Biesenberger type of operation when the objective is principally improvement of appearance a method involving free graft of the nipple is the one of choice in the most bulky cases and is a great asset in the general surgery of obesity

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some women but of great importance to others The possibility should always be indicated pre operatively it is difficult to predict Anatomists say that the peripheral pathways of erotic sensation of the nipple are matters of dispute Minor reductions commonly carry no risk but complete loss of erotic sensation in one nipple after a quite minor reduction has been seen In most major or two stage reductions, *and in all free graft reductions, there is complete loss of erotic* sensibility

Keloids and scars

The scars around the nipple and in the inverted "T" incisions are very often pink and broad for a matter of months after operation They almost invariably become flat, pale and inconspicuous In the mammaplasties here described no scar lies above the nipple, and that circumcising the nipple is completely unnoticeable In general it can be said with confidence that the patients themselves discount the scars entirely, against the advantages of reduction in weight and improvement in shape of the breasts

Fat necrosis

Fat necrosis is a troublesome and not infrequent complication after the Biesenberger type of breast reduction There is a firm lump slightly adherent to surrounding tissues which may persist indefinitely, although most such lumps resolve in a matter of months Nevertheless if the lump persists there is nothing else to do but to excise it and subject it to histological examination Except for the difficulty in differentiating it from carcinoma these patchy areas of fat necrosis are not otherwise important

Carcinoma

No increased tendency to carcinoma after breast reduction has been reported or is to be expected The incidence is less than the national average in unreduced breasts Nevertheless, one of the writer s patients did develop a carcinoma about 5 years after her reduction This was removed by local mastectomy within a few weeks of being noticed The operation was followed by irradiation and the patient is alive without evidence of recurrence 4 years later

SURGICAL RELIEF OF THE FLAT CHEST

All that has been said about the psychological indications for reductions of bulky and dependent bosoms can be repeated about girls who are flat chested It is true that swimming and exercises which develop the pectoral muscles are in general good for the breast form but they cannot produce an adequate breast promontory when the chest is flat or the breasts are depleted It is not widely enough known that much can be done by operation to restore the depleted breast and to give a breast form to a girl who lacks one Choice of method rests between the use of autogenous grafts and the use of foreign implants The writer prefers autogenous dermolipomatous grafts from the buttock combined with a rearrangement of the breast tissue and tightening of the skin However these methods can only produce a limited forward projection of the breast Edgerton and McClary (1958) have made a most careful trial of the use of a foreign implant Ivalon in selected cases This sponge implant which can give a substantial breast form when implanted behind the breast parenchyma and in front of the pectoralis

be almost within the bounds of normality Many of them are not disfiguring and do not ordinarily merit surgical excision Patients for surgery need to be selected with care and operation carefully planned Practitioners are likely to be con sulted about the three common varieties although there are many rarer forms

Vascular naevi

Haemangiomas can usefully be divided into the following four categories

Spider angioma (spider naevus arterial spider)

Spider angioma consists of a central pinhead sized pulsatile arteriole seen as a red spot from which spread a number of fine capillary vessels It is commonest on the head the neck and the distal parts of the limbs and may be solitary or one of many Not all patients seek treatment but for those who do the lesions may be cured by coagulating the central ves el with the diathermy or galvanocautery point Trichloracetic acid applied on a pointed orangestick is as effective but requires meticulous technique to avoid accidents

Capillary angioma

Capillary angioma is a flat red patch of any shape or size It varies in colour from pale pink to a deep port wine stain The pale ones tend to clear spon taneously The darker ones tend to become nodular at middle age Radiotherapy is useless sclerotics are unsatisfactory and tattooing with Chinese white is not very helpful Surgery is indicated for the smaller lesions involving for example, half the nose and the adjacent lower eyelid but for the very extensive lesions in women a consultation with one of the large firms of cosmetic manufacturers is the wis st course

Cavernous angioma

Cavernous angioma is a raised bluish dome shaped swelling consisting of d eply situated vessels in and below the dermis

Capillary cavernous angioma

Capillary cavernous angioma is raised red and circumscribed--the common strawberry naevus

Management of cavernous angioma and capillary cavernous angioma

Many of the angiomas of the last two types (cavernous and capillary cavernous) involute completely and spontaneously subsequent observations apply only to these Their natural history shows three phases (Lister 1938) There is a rela tively rapid growth up to the age of 9–12 months During the next 2–3 years growth is commensurate with that of the child and during subsequent years there is regression in size and vascularity which is usually complete by the age of 7–9 years Lesions on the mucous membrane for example the lip may persist up to the age of 13–14 years For 90 per cent of such angiomas all that is required is reassurance and surveillance during the stages of evolution According to Ronchese (1946) the indicat ons for more positive treatment are as follows

(1) SITE —If the angioma is located in a position where it is liable to interfere with the function of an organ for example on the eyelid around the mouth the nares the vulva or the anus

(2) SIZE.—If it is so large as to be conspicuously prominent and liable to trauma

(3) PARENTAL ANXIETY —Sometimes the parents fears cannot be allayed by reassurance only (a reason not necessarily acceptable to the surgeon)

CHAPTER 29

BIRTHMARKS, WARTS AND MELANOMAS

C D CALNAN AND R L G DAWSON

BIRTHMARKS

Introduction

A NAEVUS sometimes taken to be synonymous with the lay term birthmark' has been defined by Weber (1951) as a usually more or less localized congenital or developmental abnormality of tissue as evidenced by its form bulk texture colour, and functional and metabolic activity By this definition much more is included than skin blemishes present at birth, though for many reasons the skin is more frequently involved than any other organ By no means all naevi are visible at birth, though by definition some sort of defect of the region was already present Many naevi are harmless and cosmetically of no detriment to the patient and if the physician s advice is sought, all that is necessary is an explanation of the imperfections of Nature, coupled with reassurance

So little is known of the nature and control of growth that it may at times be difficult to differentiate naevi from benign or even malignant new growths, for example a leiomyoma in the stomach is regarded as a benign neoplasm while one in the skin is usually considered a naevus Basal cell epitheliomas are rightly classed with the malignant neoplasms but some of them are undoubtedly naevi (Paul 1950) Unlike most benign neoplasms, naevi tend not to be encapsulated and they blend with the surrounding normal tissue without exciting any reaction

Birthmarks in the skin tend to exhibit one of three general patterns of behaviour (1) they appear at or after birth and remain fixed and unaltered throughout life, (2) they appear develop and evolve over a period of time and then involute either partially or completely or (3) they appear, enlarge and extend as a result of stimuli such as physical trauma and the endocrine changes associated with puberty pregnancy and the menopause

Knowledge of the natural history of the commoner naevi is of paramount importance to the doctor when considering what advice to give to patients and parents An important factor is the possibility of the birthmark being associated with an abnormality of internal organs the skin lesion then being merely the outward sign of a more serious underlying disorder Examples of this are adenoma sebaceum associated with epilepsy tuberous sclerosis or rhabdomyomas, capillary haemangioma of the skin associated with a cerebral angioma (Sturge–Kalischer–Weber syndrome) and capillary angioma with congenital arteriovenous fistulae and often unilateral gigantism In such cases it is clearly pointless to attempt any treatment of the skin lesion alone

There are, in general, three lines of management of birthmarks bearing in mind the various factors mentioned above The clinician may avoid interference while the process involutes naturally either partially or completely he may speed the natural process of involution by various methods of sclerosis or radiotherapy, or he may recommend surgical removal Some birthmarks are so common as to

the dermo epidermal junction it may be termed a junctional naevus while if it is made up of Schwann cells only it is a d rmal naevus, a compound naevus contains both The importance of this distinction will be seen in relation to malignant melanomas Occasionally small groups of ectopic melanoblast cells are found in the mid dermis completely isolated from the epidermal melanoblasts Such a lesion is called a *blue naevus*, the pigment in the cells is melanin but the blue colour depends on the depth in the dermis at which the pigment is situated

As these naevoid cells come from the neural crest tissue they are endowed with the tyrosinase enzyme system which can convert tyrosine to melanin Hence all such naevi can produce this pigment They use this power to varying degrees and thus may be any shade of pink black brown or blue They may be solitary or numerous and any shape or size They may be smooth or hairy, sometimes the hairs being particularly large and coarse

Cellular naevi may be obvious at birth or at almost any age Endocrine factors have some influence efflorescences being noted at puberty pregnancy and the menopause On occasion minor physical trauma is said to precede the appearance of a cellular naevus

Patients may seek treatment for cosmetic purposes eruption of new naevi or the enlargement colour change or haemorrhage of pre-existing naevi There are many possible causes of enlargement in a cellular naevus it may proliferate in a purely benign fashion as a result of endocrine or other stimuli acute or chronic inflammation may take place around it consequent upon some injury a foreign body granuloma may be produced around a ruptured hair follicle owing to releas of keratin after hairs have been plucked haemorrhage and lastly malignant melanomatous change may occur

There are three main indications for treatment first cosmetic considerations secondly changes in the appearance of the naevus and thirdly doubts in the mind of either the doctor or the patient The choice of treatment available is either diathermy epilation of hairs coagulation destruction by the diathermy or galvano-cautery and surgical excision If there is a reasonable possibility of a naevus having become a malignant melanoma the patient should naturally be referred to a surgeon at once This aspect is considered in more detail below the heading M lanomas However with this possibility excepted much thought should be given to the question of treating cellular naevi The vast majority are not regarded by patients as cosmetic blemishes and no treatment should be given or advised When tr atment is contemplated in the presence of one of the indications mentioned above careful thought must be given to the various circumstances The simplest procedure is the permanent epilation of coarse projecting hairs from a cellular naevus (with a needle diathermy to the roots rather than electrolysis) It r quires no anaesthetic and leaves no scar but demands some skill If cosmetic removal of the naevus is decided upon the alternatives are surgical excision or cauterization The latter is only suitable for raised lesions and levels out the skin with a minimum degree of scarring It provides no specimen for histological examination and does not remove the lesion entirely although recurrences are extremely rare Surgical excision removes the naevus completely and it can be examined histologically for confirmation of the diagnosis The wound will require suture and the scar may take some months to settle down While most incisions on the face and head heal well certain other parts of the body such as the upper arm, buttock and thigh may produce stretched scars and scars on the front of the chest readily become keloidal Such considerations are not to be

(4) EXTENSIVE GROWTH —Rarely the speed and extent of growth is such as to cause alarm

(5) ONSET OF COMPLICATIONS —The principal complications are sepsis and haemorrhage Both of these are usually associated with thrombosis of some vessels in the angioma giving rise to necrosis, ulceration, and partial cure Systemic penicillin and local chemotherapeutic agents can be used for sepsis, while simple pressure controls haemorrhage Extremely infrequent complications are damage to organs such as an ear, the nose, the mouth or the eye giant growth—with extension into the deeper tissues which is progressive and fatal malignant change into angiosarcoma, cardiac effects owing to excessive arteriovenous short circuit ing, thrombocytopenia

Although the majority of parents will accept the reassurance of their general practitioner, he may need to refer some patients for a second opinion In such circumstances a dermatologist is probably the best person to decide between the alternatives of surgery, radiotherapy sclerotics and avoidance of active measures

Many parents are willing to take any risks to have the blemish removed from their child s skin, so that they can feel that they have done everything possible to avoid the mark persisting to adult life but since the lesion is benign and will resolve over subsequent years no risks are justified Radiotherapy—the total dose of which should never exceed 1 000 r to any one area—will often halt rapid growth and speed involution to some extent (Brain and Calnan, 1952) It is being used less now than previously because of an increasing awareness of the risks from radiation in young children It should never be used over the scalp epiphyses breasts or gonads eyes, thyroid gland or teeth, without adequate lead screening None the less it is a simple method of treatment and greatly reinforces reassurance as to a successful outcome for large unsightly lesions it is justifiable

Surgical excision offers an immediate cure in many instances For small lesions the risks are small but admission to hospital a general anaesthetic and a sub sequent scar are inevitable The removal of larger lesions often requires multiple operations sometimes involving difficult dissection from underlying structures where damage to a nerve or a sphincter may be disastrous

The correct time for surgery is at the age of 7–8 years when spontaneous involution is almost complete and larger angiomas have left an area of loose atrophied skin which can be excised and replaced by a neat scar

Finally it must be admitted that there are some cavernous angiomas which persist into adult life Wallace (1953) found 8 such cases among 290 patients As indications of the likelihood of the persistence he noted a family history of the same condition intense redness growth always proportional to the child and large visible veins leading away from the angioma

Cellular naevi

Cellular naevus is the dermatological synonym for the ordinary brown or flesh-coloured mole The term is really a histological one, since it denotes a naevus made up of certain cells all with a particular embryonic origin The cells all arise from neural crest tissue in the embryo and as far as the skin is concerned they form the melanoblasts of the basal layer of the epidermis and the cells of the sheath of Schwann covering medullated nerve fibres Either or both of these two elements can proliferate locally as a naevus Groups of these cells tend to segregate from their site of origin but it is usually possible to see a link between them If a cellular naevus comprises cells which have segregated from the melanoblasts at

other countries It has become a major problem in Great Britain for school medical officers general practitioners and dermatologists In some areas more than 10 per cent of the patients now referred to a hospital skin clinic attend with warts Little is known of the epidemiology of warts or of the causes precipitating the present problem

The incubation period for warts is 6–9 months and they are commonest in children and young adults There is no confirmed proof of antibodies or immunity to the virus There are several clinical and histological varieties of warts some determined mainly by their situation but no evidence of more than one virus Apart from the ordinary common wart (verruca vulgaris) other morphological types are plane filiform hyperkeratotic plantar and accuminate Plantar warts are as it were inverted by the pressure on the sole of the foot *Accuminate warts* are soft vascular lesions that occur in moist macerated sites such as the genitalia the anus and some other flexures They are often called condylomata accuminata o venereal warts but must not be confused with syphilitic condylomas although they may have been acquired by venereal contact

No antibiotic or chemotherapeutic agent is known to influence the intracellular virus of warts Their natural history however though extremely variable is towards spontaneous involution often unnoticed by the patient after weeks months or years This occurs with greater frequency in children than in adults Involution may follow almost any non specific procedure whether given by the doctor wart charmer or hypnotist The veracity of this is unquestionable in spite of the fact that the elucidation of the mechanisms involved has defeated all investigators No treatment is known to prevent recurrences or to suppress warts which are being incubated The efficacy of and indications for treatment must be judged against this background

Treatment

The therapy of warts is by no mean a simple problem Broadly speaking they can be destroyed or they can be encouraged to involute Neither method is entirely satisfactory or successful The methods of destruction are heat (diathermy or galvano-cautery) cold (carbon dioxide snow or liquid nitrogen) chemical necrosis (nitric acid trichloracetic acid podophyllin and so on) and surgical excision Local or general anaesthesia is usually required for the first and last mentioned methods depending on the number the size and the situation of the warts and on the age of the patient Curetting out with a small sharp curette is sometimes a useful adjunct before heat coagulation which also effects haemostasis The use of carbon dioxide snow (from small Sparklet cylinders) or liquid nitrogen necessitates special technique and training

Necrotizing chemical agents such as nitric acid will only be effective if they are brought into contact with all the wart cells and this usually entails a good deal of paring down to allow penetration Small accuminate warts on the penis vulva anus and other moist sites frequently respond well to a solution of podophyllin resin (25 per cent in spirit or liquid paraffin) the application of which requires experience

Surgical excision of plantar warts is indicated where all other forms of treatment have failed and where a suitably long albeit painful time has elapsed waiting for spontaneous involution On the sole excision with a local flap repair can only be performed without risk of painful scarring in certain specific areas X ray therapy can do serious damage here and should never be used

over emphasized, but they should be weighed when the surgery is undertaken for cosmetic reasons only

If a patient complains of some noticeable change in the size shape, colour or other appearance of a naevus the possibility of a change to malignant melanoma should always pass through the doctor s mind In such circumstances, surgical excision should be advised at once, even though some causes of enlargement of cellular naevi are benign If there is doubt about the nature of a lesion being a cellular naevus, it is wise to refer the patient to a dermatologist or to a surgeon A biopsy or excision may be indicated for diagnostic purposes, but not necessarily so, and many patients may be spared even so minor a surgical procedure espec ially children

Epidermal naevi

As with haemangiomas there is wide variation in epidermal naevi and they are frequently associated with abnormalities of the dermal tissues Clinically, they appear as warty thickenings which tend to be linear and sometimes extend over long stretches of skin They can be distinguished from virus warts by the fact that they have been present since infancy They are especially common on the head and neck Histologically there is a varying degree of hypertrophy of the layers of the epidermis sometimes with dyskeratosis and dyschromasia The associated changes are hyperplasia of the sebaceous glands which can make the lesion look very yellow the presence of ectopic apocrine glands naevoid proliferation of the apocrine glands (so called syringocystadenoma papilliferum) and basal-cell epitheliomas (which do not usually appear until after puberty)

Accurate diagnosis of these lesions is important for two reasons First because superficially destructive measures such as the use of caustics or diathermy will rarely prevent recurrence and secondly because of the risk of a rodent ulcer appearing at a later date The only satisfactory treatment is full surgical excision since the abnormal dermis must be removed as well as the epidermis The indica tions for such treatment are cosmetic considerations and enlargement which may be due to epitheliomatous change

Other naevi

The varieties of naevi in the skin are legion some so common as to be nor mal —for example, seborrhoeic warts and the Campbell de Morgan spots— and some rare Probably every individual has some such lesion they may be comprised of any normal or ectopic cell or tissue in the skin Some examples are connective tissue naevus or elastoma lymphangioma mastocytoma, leiomyoma lipoma hidradenoma milium myo epithelioma neuroma osteoma chondroma and hamartoma They cannot always be diagnosed clinically although this is desirable since surgical excision is not always indicated In some instances satisfactory spontaneous involution takes place without interference, in others cauterization is more suitable in yet others the process may be widespread and surgical excision of a single lesion will not benefit the patient Hence it is wiser to refer patients with such abnormalities to a dermatologist who will invoke the help of a surgeon if excision is likely to give the most satisfactory result

WARTS

Warts or verrucae are proliferative lesions induced by a virus infection of the epithelial cells of the epidermis There has been a fantastic increase in the incidence of warts over the past two decades both in Great Britain and in many

in entire agreement with this view discretion usually persuades one to remove any such lesion which is the cause of anxiety to either the patient or the physician but the routine excision of cellular naevi even those with active junctional change histologically is not justified

Diagnosis

Malignant melanoma has long held a sinister reputation in the minds of doctors and although this may have been justified at one time the facts do not entirely substantiate it now Melanoma is not a common tumour in ordinary clinical practice comprising only 3 per cent of all skin cancer and with modern therapy the survival rates are better than with many carcinomas Effective treatment must depend on efficient diagnosis and information on the diagnosis of melanomas cannot be viewed with complacency

Becker (1954) in Chicago found that of 169 skin lesions diagnosed clinically only 72 (43 per cent) were confirmed histologically as melanomas and of 151 pathological specimens of melanomas only 72 (48 per cent) had been correctly diagnosed by the clinician Similar material was analysed from the Johns Hopkins Hospital (McMullan and Hubener 1956) of 115 ' clinical melanomas only 44 (38 p r cent) were confirmed and of 87 histological melanomas only 44 (50 per cent) had been so diagnosed Even if the figures in Great Britain are better than these it indicates that there is about a 50 per cent error in the diagnosis of malignant melanoma What effect such an error has on the prognosis is impossible to estimate

It should not be imagined that all the errors in diagnosis are on the side of the clinician A histological diagnosis may be wrong in up to 10 per cent of cases in some departments The chief lesions giving rise to such mistakes are blue naevi pigmented cellular naevi and histiocytomas

From the evidence quoted in the above mentioned publications it can be seen that most of the problems in the diagnosis of melanoma centre around the presence or absence of pigment and the necessity to consider it as a possibility in any isolated skin lesion It has been stated already that cellular naevus and malignant melanoma cells all carry the tyrosinase melanin enzyme system but there are many varied factors which stimulate and inhibit this system The production of melanin pigment is not an essential property of the melanoma cell and it certainly bears no relationship to the degree of its malignancy Contrariwise melanin pigment can be heavily deposited in other tumours such as basal cell epitheliomas s borrhoeic warts and Bowen s disease moreover melanin can be simulated in a skin tumour by haemosiderin pigment to produce a pseudo-melanomatous appearance as in some histiocytomas Many authors have enumerated aids to the physician in the diagnosis of melanoma—increase in pigmentation in a pre existing mole radial extension of pigmentation increase in size ulceration or haemorrhage from a mole Cellular naevi sometimes increase a little in size and in depth of pigmentation during pregnancy without necessarily undergoing melanomatous change

Management

Without doubt the presence of a malignant melanoma or a strong suspicion of it is a *prima facie* indication for surgery

The type and extent of the surgical procedure and whether the regional lymph nodes should be removed at the same time or after an interval of 3 months to

The selection of the method of treatment for each patient will often depend upon the number type and site of the warts the degree of urgency and cosmetic considerations For example the subungual periungual and beard areas, as well as the nares can be difficult sites A large cluster of plantar warts (the " mosaic" type) is exceptionally resistant and has a high recurrence rate Procrastination by some means or other can produce a cure in about 30 per cent of patients

At least 14 different lesions resemble and can be mistaken for warts If there is the slightest doubt about the diagnosis and a consultant opinion is required it *is wisest to send the patient first to a dermatologist who can best decide if a* surgical or medical procedure is indicated

MELANOMAS

The term melanoma was first used by Carswell (1838) in his treatise on pathological anatomy The majority of physicians and surgeons use it to mean a malignant tumour but some pathologists still speak of benign and malignant melanomas and will on occasion give the diagnosis melanoma to a benign lesion (pigmented cellular naevus) (*see* page 261) This confusion can be serious and the writers prefer to reserve the term melanoma only for a malignant melanoma

Melanomas are derived from the same type of embryonic cell that gives rise to cellular naevi Melancytoblasts are split off from the neural crest of the embryo and spread throughout the body to form the melanoblasts of the basal layer of the skin and the Schwann cells of nerve sheaths carrying with them the tyrosine melanin enzyme system It is when these cells become malignant that a melanoma has begun Such tumours are most common in the skin but they have been known to occur in internal organs In spite of the similarities in cell origin of cellular naevi and melanomas the precise pathogenesis of the latter is by no means clear It has been mentioned on page 256 that cellular naevi are essentially composed of two parts a collection of cells which are budded off or segregated from the melanoblasts at the dermo epidermal junction and another collection in the dermis which arise from the cells of the sheath of Schwann of medullated nerves Primary cutaneous melanomas always show segregation or junctional activity at the dermo epidermal border and hence it is assumed that they only arise in this way It is believed that purely dermal cellular naevi or naevi containing coarse hairs rarely if ever develop into malignant melanomas

There is much difference of opinion as to whether melanomas arise *de novo* or in a pre existing and therefore pre malignant lesion The distribution of cellular naevi and melanomas is not parallel but there is much evidence to support the view that at least 50 per cent of all melanomas arise from naevi although estimates vary from 18 to 100 per cent

Melanomas appear rarely to develop in naevi which have been present since birth but there are three types of lesion starting after birth and usually post puberty which are accepted as being pre melanomatous These are cellular naevi with junctional changes a malignant lentigo (the melanotic freckle of Sir Jonathan Hutchinson) and a blue naevus Nothing is known about the stimuli which produce melanomas but the endocrine changes of the sexual epochs and local physical trauma have been suspected as being of some importance It is widely held that friction and trauma promote melanomatous change in cellular naevi, and hence it is often advised that all pigmented naevi in such places as the palms the soles the axillae, the groins or those areas subjected to trauma from clothing should be excised prophylactically Whilst the present authors are not

an irregularly shaped brownish macule which shows a tendency to be darker nearer its centre and in the centre it may show a jet black spot When true malignant melanomatous change begins it is generally seen as an increase in size of the black area and an elevation of the centre to form a papule and then a nodule The growth however remains slow and spread to the regional lymph nodes is often delayed for many months or longer Haematogenous spread is quite uncommon hence the surgical treatment may be more conservative Although lentigo maligna is accepted as a pre melanomatous lesion many affected patients end their lives from other causes before the onset of malignant change For this reason surgical excision is not necessarily indicated in every case provided the patients are kept under supervision at 3-monthly intervals

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trap metastasizing cells and the use of ancillary radiotherapy and chemotherapy are all matters to be decided by the individual surgeon Many surgeons believe it is easier to do too little than too much Melanomas are often sensitive to x rays and treatment may sometimes be decided best at a tumour clinic with the con joined services of surgeon, radiotherapist, pathologist and dermatologist They are however, urgent problems and should be treated almost as surgical emergencies if the patient is to be given the utmost chance of success With modern surgical methods the 5 year survival rate is about 50 per cent which compares favourably with many other forms of cancer, but it remains extremely difficult to predict the outcome in an individual case and there must be numerous factors which influence the prognosis One such is the site of the primary tumour for example melanomas on the lower limb appear to have an almost uniformly bad prognosis irrespective of the extent of surgical treatment Pregnancy also usually has a very adverse effect

The above considerations apply to patients with melanomas However it can be seen that the principal difficulty is in deciding whether or not the patient has a melanoma as in most instances the physician s diagnosis is correct in only 50 per cent of the cases Should the other half be treated in the same way by reason of prophylaxis? It is serious to carry out an extensive excision or even amputate for a pigmented lesion which is eventually found to be benign Should a diag nostic biopsy be performed? Are quick frozen sections at the time of operation sufficiently reliable? Answers to these questions cannot be generalized but will depend on the individual assessment of each patient Many surgeons do not agree with biopsies of potential melanomas If the physician feels fairly sure that a patient has a melanoma that patient should be referred to a surgeon for his opinion and if he supports the diagnosis for surgical excision and histological examination If the physician sees a patient with a lesion which he feels may be a melanoma it is often wise to refer the patient first to a dermatologist since he is the person likely to be most familiar with the many pigmented and other lesions of the skin which have to be considered in the differential diagnosis If he has any doubt that the lesion may be a melanoma he will ask a surgeon to excise it Any pigmented lesion on the skin should be considered as a possible melanoma and if a pigmented lesion shows any change in size shape colour haemorrhage ulceration or other feature the index of suspicion should immediately be raised much higher There is no doubt that the vast majority of pigmented skin lesions are benign mostly comprising cellular naevi freckles and seborrhoeic warts but the consequences of leaving a melanoma undiagnosed are too serious No exten sive surgery should be undertaken without a histological diagnosis In a suspected melanoma the local excision biopsy for this purpose should be performed by a surgeon The histological diagnosis of melanoma is not always easy for the path ologist In recent years it has been appreciated that benign naevi in pre pubertal children may show a histological picture which would be accepted as highly malignant in an adult

Malignant melanoma virtually does not occur before puberty and nothing more than purely local removal of a pigmented skin lesion will then be required Mela nomas are by no means unknown in old age However less radical surgery may be undertaken in aged patients for the prognosis is often better One reason for this is that a number of melanomas in old people arise from a slow growing pre malignant lesion called a lentigo maligna (melanotic freckle) It is most frequently seen on the cheeks and about the face and head but may occur anywhere It is

sharp nature of the pain of direct sensory (dorsal) root stimulation has also shown that pain may arise from similar stimulation of the motor (ventral) root It is then deep and aching in quality and can be abolished by procaine block of the *sensory* root This pain might possibly be due to muscle spasm There is however no convincing evidence for muscle spasm as a cause of spinal pain its presence usually being secondary to a painful lesion of the spine and its function protective splinting It seems therefore that any lesion of the spine may be expected to produce referred pain and with it referred tenderness which is of little value for localizing such a lesion However if it involves pain fibres of sensory nerves directly which happens most often at the intervertebral foramen it will produce so-called *nerve root pain*

THE ORIGINS OF SPINAL PAIN

Vertebral bony lesions

Lesions of the vertebrae giving rise to pain include traumatic and pathological fractures neoplasms notably metastases from carcinoma of lung or breast and myelomatosis osteoporosis and osteomalacia and uncommonly infections notably tuberculous caries Being pathologically distinct lesions of bone their diagnostic criteria are well defined and readily proved by radiological or pathological investigations Less clear in its relation to spinal pain is spondylolisthesis that is a forward subluxation of a vertebral body owing to spinal instability The cause of this may be congenital deformity or the rare fracture of the pars interarticularis (spondylolysis) or deficiency of the facets of the apophysial joints Its association with spinal pain although often because of secondary degenerative changes is undoubted and its diagnosis is susceptible to radiological proof Further as its treatment requires special considerations it is convenient to refer to it as a separate entity

Vertebral joint lesions

With the exception of ankylosing spondylitis the relation of disorders of the intervertebral joints to spinal pain is not clear cut Thus while spondylitis gives rise to well-defined clinical and radiological changes the far commoner condition of degenerative joint disease of the intervertebral joints (spondylosis) is as evidenced by radiological examination the invariable accompaniment of ageing It is therefore difficult to relate to pain in any one patient Similarly congenital defects of the spine such as spina bifida hemivertebrae fused cervical vertebrae or Klippel Feil syndrome and sacralization of the fifth lumbar vertebra are common and easily recognized radiologically However they similarly bear an ill-defined relation to back pain in that they lead to degenerative changes which could be the source of the pain

A most important exception to the difficulty of associating degenerative changes with spinal pain is in the event of the development of neurological symptoms and signs These allow localization of the lesion and in certain circumstances permit a diagnosis of pressure on nerve roots or spinal cord from intervertebral disc tissue or from osteophytes derived from degenerative changes It follows that spinal pain with neurological features defines a group of lesions the differential diagnosis of which includes prolapsed intervertebral discs disc degeneration with osteoarthritis of the vertebral synovial joints or osteophytic ridges on the posterior edge of the vertebral body spinal tumours and lesions of the spinal cord itself such as syringomyelia and vascular lesions

CHAPTER 30

NECKACHE AND BACKACHE

E J RADLEY-SMITH AND *A T RICHARDSON*

PAIN felt in the region of the neck or back is one of the commonest of symptoms but while in the majority of patients so afflicted the origin of the pain can be convincingly shown to be in one of the structures of the spine it is in only a minority that the nature of any pathological basis can be demonstrated For this reason aetiology is largely speculative and treatment empirical and a systematic approach to either is difficult

In general the most useful approach to the differential diagnosis of pain of spinal origin is one based on a consideration of the various anatomical structures of the vertebral column and the different lesions that can involve them To this must be added the diagnosis of visceral lesions causing pain referred to the neck or back, and psychogenic factors which commonly complicate but seldom cause pain felt in those regions

Any discussion of the differential diagnosis of neck and back pain gains little by the use of such previously popular diagnostic labels as fibrositis myofascitis neuralgia myalgia, and other generic terms for pain of undetermined origin felt in the soft tissues It is worthy of comment however that these terms although devoid of pathological meaning do at least reassure the patient In contrast the now more fashionable diagnoses of prolapsed intervertebral disc chronic disc degeneration and spondylosis often distress patients although their increasing use as synonyms for spinal pain of uncertain origin is rapidly destroying their pathological implications

TYPES OF SPINAL PAIN

The sensory nerve supply of the vertebral column comes from branches of the posterior primary rami of the spinal nerves and the nerves of Luschka both of which contain pain fibres The former supply the joint sacrospinalis muscle and overlying tissues the latter supply the posterior longitudinal ligament the vertebral periosteum and the dura mater The existence of a sensory nerve supply to the annulus of the intervertebral disc is controversial These nerves and the nerve root itself are the pathways and if subjected to pressure or kinking probably the source of two distinct types of pain The first type is generally described by the patient as boring aching or burning and is poorly localized This is the referred type of pain termed sclerotogenous by Inman and Saunders (1947) It arises from damage to any mesodermal structure and may be imitated by injecting hypertonic saline solution into the vertebral ligaments (Kellgren 1939) or by distending the intervertebral disc with injected fluid (Hirsch 1948) Such pain may radiate into the limb and be accompanied by tenderness of the painful area

In contrast is the sharp lancinating and radiating pain which indicates direct involvement of nerve pain fibres This nerve pain is comparable to skin sensation and has been termed dermatogenous Frykholm (1951) as well as confirming the

sharp nature of the pain of direct sensory (dorsal) root stimulation has also shown that pain may arise from similar stimulation of the motor (ventral) root It is then deep and aching in quality and can be abolished by procaine block of the *sensory* root This pain might possibly be due to muscle spasm There is however no convincing evidence for muscle spasm as a cause of spinal pain its presence usually being secondary to a painful lesion of the spine and its function protective splinting It seems therefore that any lesion of the spine may be expected to produce referred pain and with it referred tenderness which is of little value for localizing such a lesion However if it involves pain fibres of sensory nerves directly which happens most often at the intervertebral foramen it will produce so-called nerve root pain

THE ORIGINS OF SPINAL PAIN

Vertebral bony lesions

Lesion of the vertebrae giving rise to pain include traumatic and pathological fractures neoplasms notably metastases from carcinoma of lung or breast and myelomatosis osteoporosis and osteomalacia and uncommonly infections notably tuberculous caries Being pathologically distinct lesions of bone their diagnostic criteria are well defined and readily proved by radiological or pathological investigations Less clear in its relation to spinal pain is spondylolisthesis that is a forward subluxation of a vertebral body owing to spinal instability The cause of this may be congenital deformity or the rare fracture of the pars interarticularis (spondylolysis) or deficiency of the facets of the apophysial joints Its association with spinal pain although often because of secondary degenerative changes is undoubted and its diagnosis is susceptible to radiological proof Further as its treatment requires special considerations it is convenient to refer to it as a separate entity

Vertebral joint lesions

With the exception of ankylosing spondylitis the relation of disorders of the intervertebral joints to spinal pain is not clear cut Thus while spondylitis gives rise to well-defined clinical and radiological changes the far commoner condition of degenerative joint disease of the intervertebral joints (spondylosis) is as evidenced by radiological examination the invariable accompaniment of ageing It is therefore difficult to relate to pain in any one patient Similarly congenital defects of the spine such as spina bifida hemivertebrae fused cervical vertebrae or Klippel Feil syndrome and sacralization of the fifth lumbar vertebra are common and easily recognized radiologically However they similarly bear an ill-defined relation to back pain in that they lead to degenerative changes which could be the source of the pain

A most important exception to the difficulty of associating degenerative changes with spinal pain is in the event of the development of neurological symptoms and signs These allow localization of the lesion and in certain circumstances permit a diagnosis of pressure on nerve roots or spinal cord from intervertebral disc tissue or from osteophytes derived from degenerative changes It follows that spinal pain with neurological features defines a group of lesions the differential diagnosis of which includes prolapsed intervertebral discs disc degeneration with osteoarthritis of the vertebral synovial joints or osteophytic ridges on the posterior edge of the vertebral body spinal tumours and lesions of the spinal cord itself such as syringomyelia and vascular lesions

"Sprung back" and coccydynia

Two conditions with generally accepted criteria for diagnosis are sprung back and coccydynia They may usefully be considered together as they are unique as causes of *spinal pain in owing their diagnosis* largely to the detection of localized tenderness, in the former over the supraspinous ligament and in the latter over the coccyx Sprung back is conceived by Newman (1952) as a rupture of the inter spinous and the more important supraspinous ligaments following a fall in the sitting position or lifting with a flexed spine The diagnosis is considered proved if relief is obtained by the injection of local anaesthetic into the offending ligaments

Coccydynia when not derived from fractures injury to the ligaments of the sacrococcygeal joint, or referred pain from the first sacral segment is probably of central (psychological) origin

Visceral lesions

While it is well recognized that some renal lesions such as calculi and hydronephrosis some abdominal lesions for example dissecting aneurysm of the aorta renal vein thrombosis and pancreatic disease and some pelvic lesions for example, salpingitis may give rise to back pain the incidence of such lesions imitating pain of spinal origin has undoubtedly been exaggerated in the past Similarly lesions *of structures lying in the posterior triangle of the neck such as lymphadenitis seldom present difficulty in differential diagnosis from spinal* lesions However pain in the neck or back of dural origin from spinal or posterior fossa tumours subarachnoid haemorrhage or meningitis may occasionally imitate a lesion of the bony structure of the spine and may indeed derive from such a lesion

Altogether, the above groups of pathologically well defined disorders where a definite diagnosis is generally possible and where there is a clear cut relation to pain felt in the neck or back are responsible in only a small proportion of patients complaining of such pain For example Ghormley (1951) reporting 2 000 consecutive cases of low back pain seen at the Mayo Clinic gave the incidences of tuberculous spondylitis as 1 9 per cent osteitis deformans as 0 1 per cent metastatic neoplasms as 0 1 per cent, trauma usually fractures as 3 per cent ankylosing spondylitis as 6 5 per cent and gynaecological causes as 0 2 per cent

Spinal pain of unknown aetiology

The vast majority of patients complaining of neck and back pain form a group characterized by having little variety in symptoms no physical signs other than reproduction of the pain by spinal movements—the common denominator of all organic spinal lesions—no radiological signs beyond the usual degenerative changes and no demonstrable pathological basis for their complaints It is to this group that a great many diagnostic labels have been applied and for which a remarkable amount of pathology has been invented Clinically it is possible to recognize two syndromes into which the majority fit namely spinal pain of acute onset and chronic spinal pain

Spinal pain of acute onset

Acute neck pain (ricked neck) or back pain (lumbago) because it is often of fulminating onset and sometimes of equally sudden remission is now widely considered to be derived from mechanical derangements of the spinal joints The locking of an internally deranged knee joint is a valid comparison

Such a concept invokes referred pain from the damaged joints and secondary muscle spasm to explain the clinical picture and spinal insufficiency derived from acquired or congenital deformities or inadequacy of the spinal muscles or ligaments as predisposing causes As to the type of mechanical derangement the tendency to over simplify and theorize continues In the past such unlikely lesions as sacro-iliac strains were conceived even in other than post parturient women and in the absence of pain reproduced by springing those joints Now lumbar thoracic and cervical regions are unified in terms of supposedly common mechanical derangements based on the as yet unproven presence of loose bodies nipped synovial fringes or subluxations of the apophysial joints (Crisp 1952) or inter vertebral disc prolapse with bulging of the posterior ligaments and dural pressure (Cyriax 1945) or of displacement and impaction of a disc nucleus sequestrum (Armstrong 1952) In favour of this disc aetiology is the occasional development of signs of nerve root or cord pressure in patients with prolonged or recurrent neck or back pain initially of acute onset Hult (1954) illustrated this by reporting the incidence of lumbar insufficiency lumbago and sciatica in a group of patients and showing that their incidence in combination was higher than that expected from the incidence of each in the whole group Further the op rative findings in the majority of cases of recurrent spinal pain of acute onset inculpate disc abnormalities as the cause Similarly the often dramatic relief of acute lumbago by epidural injections points to a dural origin of the pain although the unexplained success of local procaine injected into the areas of referred tenderness in the neck and back had previously appeared to indicate a soft tissue pathology

Reference must however be made to two mechanical derangements unassociated with disc abnormalities which if unrecognized can lead to disaster They are the post tonsillitis atlanto-axial dislocation in children and collapse of a vertebra from metastases myeloma or osteoporosis

Chronic spinal pain

Patients with chronic spinal pain typically have a history of previous intermittent acute neck or back pain which has later become persistent All show loss of mobility of the spine but this is not necessarily associated with the muscle spasm which immobilizes the acute painful neck and back In such circumstances it is reasonable to incriminate peri articular ligamentous or even muscular adhesions arising from acute or chronic trauma recurrent mechanical derangements or degenerative change as the cause of immobility and pain

Also well defined is chronic pain of the thoracic or lumbar region in the presence of postural or bony deformities when again it is reasonable to invoke as the cause of the pain chronic ligament or joint strains leading eventually to degenerative changes

It is in this group of chronic non specific back pains particularly that psychogenic factors may predominate often derived from fear of cancer of renal disease or from a desire for sympathy escape or comp nsation

THE CLINICAL DIAGNOSIS OF SPINAL PAIN

The combination of history meticulous examination and radiology should enable a conclusion as to the cause of neck or back pain to be reached in the majority of cases

In the history the type of pain its distribution its mode of onset with particular reference to trauma and its relation to movements of various regions of the spine,

may not only indicate the presence of an organic spinal lesion but also supply some evidence of localization and aetiology One type of pain is particularly noteworthy, and that is the dull pain distributed up and down the spine round the chest and in the thighs, which is typical of metabolic bone disease It is characteristically accompanied by proximal muscle weakness

Symptoms of neurological complications of spinal lesions include paraesthesiae and numbness muscle fasciculation, and cramps in the event of stimulation or depression of the sensory or motor nerve roots by pressure and in the event of spinal cord pressure weakness and stiffness of the legs with paraesthesiae and pain Cord pressure may also give rise to sphincter disturbances taking the form of hesitancy urgency, and less commonly incontinence of urine

Other symptoms that may be associated with spinal pain and are important in its diagnosis include those indicative of a systemic locomotor or a visceral disorder As regards visceral disease symptoms of a pelvic lesion, although a rare cause of backache should be inquired after, with particular reference to dysmenorrhoea irregular or excessive menstruation or dyspareunia which may in particular accompany pelvic endometriosis Low back pain from vascular disease in the form of a dissecting aneurysm of the aorta should also be borne in mind and inter mittent claudication of the buttock (*see* page 201) may be confused with developing sciatica In relation to neck pain inquiry should be made for headaches and vertigo The latter occurring in cervical spondylosis is characteristically related to neck movements and may be preceded by diplopia It is a result of degenerative changes in the cervical spine interfering with the vertebral arteries and thereby with the blood supply of the midbrain (basilar artery) The importance in the diagnosis of spinal pain of any history or present symptoms suggesting a neoplasm is obvious As regards systemic locomotor disorders while recurrent or persistent backache in a young man must always suggest a diagnosis of ankylosing spondylitis and demands a radiograph of the sacro iliac joints such a diagnosis becomes almost certain with a history of iritis painful heels, or intermittent large joint swellings

It cannot be over emphasized that the essential criterion of an organic lesion of the vertebral column causing spinal pain is reproduction of that pain by move ments of the spine Further pain occurring over several regions of the spine and reproduced by movements of those regions must always suggest such a wide spread spinal disorder as spondylitis or generalized bone disease The most important symptoms in localizing spinal lesions are however those due to dis turbances of nerve roots or spinal cord The necessity of a search at each examina tion of the patient for multiple root involvement of itself suggestive of a more serious lesion than disc degeneration should need no emphasis

LOCALIZING SIGNS AND SYMPTOMS

Pain arising in the cervical spine

Lesions of the cervical spine may produce a wide radiation of pain which if bilateral is of itself evidence of a spinal derangement as indeed is bilateral pain in any region of the spine Pain from lesions of the upper cervical spine may radiate over the back of the head and to the shoulders or scapula region C5 and 6 referred pain is generally felt round the shoulder but may be referred to the chest where it may resemble angina pectoris but is without the latter s characteristic relaxation to exercise Pain from C7 and 8 may radiate into the forearm Pain from cervical lesions is commonly worse in the morning particularly if many pillows are used at night but the relation of such pain to movements of the neck

varies In an acute lesion all movements are likely to be restricted by muscle spasm and this also produces flattening of the normal cervical curve which can be seen clinically but is best demonstrated radiologically In contrast chronic lesions give rise to pain reproduced by one or more but seldom by all movements of the cervical spine The pattern of movements is rarely of diagnostic value with the exception of reproduction of the pain only by flexion in meningeal irritation

In the cervical region neurological complications are common in the form of nerve root involvement spinal cord involvement or both and while the distribution of nerve roots varies a general pattern is discernible Reference must also be made to the occasional occurrence of nystagmus in high cervical cord lesions

Cervical radiculitis

In general C5 and 6 lesions involving nerve roots produce paraesthesiae in the outer (radial) border of the forearm thumb and index finger those of C7 in the centre of the forearm and middle and ring finger and those of C8 in the ulnar border of the forearm and little finger Muscle weakness from damage to C5 and 6 roots is most marked in the proximal muscles of the arm particularly the scapular muscles deltoid and biceps and it is the biceps and supinator reflexes that are diminished muscle involvement from C7 root damage is usually maximal in the triceps and extensors of the wrist and fingers with diminution of the triceps reflex and in l sions of C8 weakness is maximal in the flexors of the forearm Th1 lesions affect the small muscles of the hand

Cervical myelopathy

The term cervical myelopathy is used to describe the neurological results of damage to the cervical spinal cord usually by osteophytic ridges This is commonly accompanied by damage to the cervical nerve roots which may precede or follow the appearance of cord symptoms The natural history of the condition in approximately a quarter of the cases is steady deterioration slower deterioration punctuated by acute episodes in others and in a smaller number very long term episodic progress

The first symptoms to appear are usually those derived from spastic weakness of one or both legs and this is associated with exaggerated reflexes and extensor plantar responses Sensory symptoms in the legs are less common and usually consist of paraesthesiae sometimes of a painful form accompanied by a reduction of pain and temperature sensation of patchy distribution Neither light touch nor posterior-column sensation are usually involved In the upper limbs while symptoms and signs are usually dependent upon root involvement as described above signs of pyramidal involvement extending for a few segments higher than the area of compression may occur probably owing to damage to the anterior spinal artery Involvement of this artery may also produce a clinical picture closely resembling syringomyelia which with disseminated sclerosis subacute combined degeneration of the cord tumours and pachymeningitis of the cervical cord and motor neurone disease comprises the main differential diagnosis

Lesions of the thoracic spine

Lesions of the thoracic spine commonly produce radiating pain which in the case of degenerative lesions is usually in the Th7–Th11 segments and may thus imitate intra abdominal disease Differentiation depends upon the fact that

thoracic root pains are reproduced by lateral flexion or rotation of the spine The accentuation of the pain by movement often forces patients to sleep with pillows at each side of the chest in order to immobilize the thoracic spine a trick which patients with metabolic bone disease may also acquire Symptoms and signs of compression of the spinal cord are remarkably uncommon in degenerative disease of the thoracic spine which is the frequent lesion in this area—though often secondary to osteochondritis of the vertebral column (Scheuermann s disease) A useful sign in the differentiation of Scheuermann s disease and ankylosing spondylitis both of which involve the thoracic spine is the development of a compensatory lumbar lordosis in the former but not in the latter

Mention must also be made of the diagnostic trap of herpetic and tabetic root pains in this area

Lesions of the lumbar spine

Low backache is probably the commonest form of spinal pain and as in other regions the essential criterion for diagnosis is a reproduction of the pain on movement usually flexion of the lumbar spine and this may be accompanied by flattening or reversal of the normal lumbar lordosis Patients with lesions of the lumbar spine commonly complain of pain which is worse in the mornings particularly after lying in a hammock position on a soft mattress Similarly it may be related to bending or straightening up or sitting slouched for long periods for instance in the bucket seat of a car

Neurological complications are not as common as in the cervical region and usually involve the roots of L5 and S1 Paraesthesiae derived from the former occur laterally in the lower leg and across the top of the foot and from the latter down the back of the leg and under the foot Weakness from the former involves the buttock and hamstring muscles and the anterior compartment muscles of the leg In the latter the posterior leg muscles are involved in addition to the buttock and hamstring muscles First sacral root lesions are usually accompanied by diminution of the ankle jerk but lesions of L5 may also cause this Root disturbances of L3 and 4 give rise to paraesthesiae at the front of the thigh weakness of the adductors and quadriceps and diminution of the knee jerk L4 root involvement may additionally produce sensory loss below the knee with weakness of inversion of the foot (tibialis posterior) An important sign of low lumbar nerve root or dural pressure is painful straight leg raising (Lasegue s sign) but it is important to realize that in the first few degrees of straight leg raising flattening of the lumbar spine is produced and this may cause pain *per se* Similarly the femoral stretch test is usually positive in involvement of L3 and 4 nerve roots which may therefore imitate hip disease or such rare lesions as sarcomatous infiltration of the psoas muscle

Compression of the cauda equina

Compression of the cauda equina is mostly due to neoplasms or displaced intervertebral discs and while the clinical picture is variable certain features are constant These are dull aching pain in the lumbar and sacral regions exacerbated by sudden movements or coughing with motor weakness and sensory loss in the distribution of the lower sacral roots often including the characteristic saddle shaped area of anaesthesia over the buttocks and thighs Disturbances of bladder and bowel function are usually a late development and take the form of retention

of urine and faeces Impotence may occur in the male and oedema of the legs in either sex

THE INVESTIGATION OF PAIN OF SPINAL ORIGIN

Radiological investigations must be performed routinely in all cases of spinal pain for bony disease of the vertebral column is largely diagnosed by this means and in cases of acute spinal pain suggesting a simple mechanical derangement only a radiograph can reveal collapse of a vertebra from neoplasm or osteoporosis Antero-posterior and lateral views are required with the addition of oblique views if there are symptoms or signs of nerve root involvement Myelography (radiography after injection of radio opaque media into the spinal cord) while an essential preliminary to operation is otherwise confined to cases in which spinal tumour is suspected on the basis of the neurological signs or to confirm a diagnosis of cervical myelopathy due to spondylosis

A lumbar puncture is of little value in the diagnosis of pain of spinal origin except when used to demonstrate a complete manometric block and a high protein content of the spinal fluid indicative of tumour

Erythrocyte sedimentation rates are of limited value although their routine use is sometimes recommended In general backache associated with a high E S R suggests m tastases myelomatosis infections or ankylosing spondylitis though it must be noted that it is not invariably raised in the last named

THE MANAGEMENT OF NECKACHE AND BACKACHE

Specific non surgical treatments for example radiotherapy for ankylosing spondylitis and metastases and antibiotics for spinal tuberculosis and pyogenic infection are beyond the scope of this chapter In the absence of any indications for such specific treatments two important considerations arise in the treatment of pain of spinal origin The first is that the natural history of the so-called acute mechanical derangements of the spine is towards remission whatever the treatment and the second that while chronic non specific spinal pain can be a severe annoy ance and hinder both work and hobbies it will very often respond to simple forms of treatment Indeed in many cases of neckache and backache the pain is so mild that reassurance from the doctor and pa ence from the sufferer are all that is required A noteworthy excep ion to this is dorsal root pain from spinal degenerative changes which is all too often severe and persistent and which usually defies treatment

The ba ic regime for all cases of non specific spinal pain consists in the acute phase of reassurance analgesics and rest When the pain remits progressive mobilizing and strengthening exercises are started and for lumbar backache advice is given on the mechanics of correct lifting As regards rest in the acute phase while this is ideally carried out by putting the patient to bed on fracture boards or alternatively on a mattress on the floor a useful and more convenient substitute is a plaster of Paris or plastic corset or neck collar There is general agreement however that if a corset or neck collar fails to relieve the pain in 2–3 weeks bed rest is indicated perhaps with traction It must be stated that while it is presumed that immobilization of the spine during the acutely painful episodes shortens the total duration of the attack of pain there is no evidence for this belief *Certainly* in the presence of neurological complications the importance of immobilization cannot be over-emphasized

To this basic regime have been added vast numbers of treatments whose only common feature apart from psychological impressiveness appears to be relief of

muscle spasm They include various forms of heat, massage liniments procaine infiltration of the tender areas and even red flannel However there are three forms of treatment which are worthy of further consideration in that they are justified in some cases of acute mechanical derangements of the spine and chronic back pain They are manipulation spinal traction and surgery

Manipulation

In theory manipulation should be effective in relieving spinal pain where it can replace a displacement or remove adhesions in or around joints or attached to normally mobile structures Clearly essential prerequisites for manipulation are that one of these conditions should exist that it should be diagnosable with certainty, and that manipulation can be guaranteed to have the desired effect without producing any harmful results These criteria would appear to be satisfied *par excellence* in spinal pain derived from acute mechanical derangements, the diagnostic features of which have already been discussed However such a theory requires justification by results to win universal acceptance of this form of treat ment It is not sufficient to argue that manipulation of the spine is so often demanded from lay manipulators that some patients must have benefited or that a number of patients, even members of the medical professions who appear to be reliable witnesses have stated that their symptoms were immediately and completely relieved by manipulation for patients have also not uncommonly complained of more pain following spinal manipulation Though many extravagant claims have been made scientific assessment of manipulation is peculiarly lacking except for the follow up analysis of Coyer and Curwen (1955) They treated 152 cases of low backache at random either by manipulation or by bed rest and analgesics rejecting only those complaining of root pain or showing signs of nerve root pressure or of radiological changes other than congenital abnormalities or degenera tive changes Three conclusions appeared from their results first that with the bed rest regime backache of this type remitted within a few weeks so that they were able to discharge 27 per cent of their control cases free from pain at the end of 1 week, and 60 per cent were well at the end of 3 weeks At the end of 6 weeks only 28 per cent still had symptoms The second conclusion was that no adverse effects followed manipulation of their patients The third conclusion was that while the results of manipulation were certainly better than those produced by bed rest alone it was by no means a cure all for backache in that some 12 per cent of patients still had persistent symptoms after 12 weeks (compared with 28 per cent of those on bed rest alone)

When any joint is manipulated it should in general be moved through its normal range which has been lost in acute pain from joint locking and muscle spasm and in chronic pain from adhesions While a variety of techniques of spinal manipulation have been used all avoid flexion of the spine which is dangerous as is manipulation in the presence of nerve root or cord involvement severe degenerative changes osteoporosis spondylolisis and spondylolisthesis The place of manipulative procedures aimed at producing movements not under voluntary control is similar with perhaps a particular indication in the acute mechanically deranged spine

Traction

Except in certain fractures the indications for spinal traction are not clearly defined but if it is used correctly it can do little harm and it is worth a trial when

other conservative methods have failed For cervical pain traction is applied with the patient lying supine using a Sayre s head sling with up to 40 pounds pull for 10–20 minutes In the lumbar spine it is more difficult to apply traction and for this reason a variety of traction tables have been introduced By means of these some 60–140 pounds are applied through a pelvic belt

It is debatable whether any appreciable benefit derives from traction on the spine other than from the enforced immobilization which accompanies it and which makes it a most useful adjunct to bed rest a plastic support (corset or neck collar) or both The only acceptable published results are those of Christie (1955) who compared the effects of traction with those of a bland pill in a series of patients with backache in whom specific pathology was excluded His results showed first that the majority of patients were unaffected by the treatment, secondly that some 18 per cent of those treated by traction had their pain aggra vated but thirdly that in a few the results of traction were quite dramatically good and fourthly that the greatest gain seemed to be in chronic backache with signs of root involvement

Surgical treatment

In general surgical intervention is seldom necessary in patients suffering from pain of spinal origin except for the treatment of trauma tuberculosis extradural abscess or tumour For the remainder while the indications are by no means well defined it is nevertheless accepted that it may be the only successful form of treatment in some cases The general indication is pain failing to respond to an adequate period of conservative treatment particularly when it is associated with persistent severe or progressive signs of nerve root or cord compression

Three procedures are available namely decompression removal of disc tissue and spinal fusion but very frequently a combination of these methods is employed

Decompression

In the cervical region decompression of nerve roots may be achieved for dorso lateral disc protrusions by hemilaminectomy but for intra foraminal protrusions partial removal of the facet (facetectomy) is necessary More often than not division of a fibrotic dural covering of the nerve root is also required Frykholm (1951) reporting the results of this procedure in 30 cases recorded 16 with com plete recovery 5 with considerable improvement 5 with moderate improvement and 4 unchanged or worse In cervical myelopathy where again the indication for operation is progressive neurological deterioration in spite of adequate conser vative treatment there is growing evidence that it is the younger person with rapid progression who responds best to operation The usual procedure consists of a laminectomy with consequent decompression of the posterior aspect of the cord If also the dentate ligaments are divided above and below the disc protru sion the cord is freed to move away from the usual osteophytic ridge which pro duces most of the cord pressure A direct attack on this osteophytic ridge may also be attempted (Allen 1952) but no assessment of the results of this more radical operation is yet available Rotation of the cord necessary for exposure of this anterior protrusion carries considerable risk of causing thrombotic lesions in it The results of the simple decompression are fairly encouraging for Northfield (1955) in 39 cases reported considerable improvement in 13 slight improvement in 9 no change in 8 with 8 worse and 1 death In general the overall picture of published results is of worth while improvement in about half the patients

The results of surgical treatment of cervical myelopathy due to bar like disc protrusion with consequent vascular pressure can be fairly accurately forecast at operation Where the cord is found shrunken and the closure of the dura is thereby made easy little good is likely to result If when the dura is first incised longitudinally, the cord bulges through the opening, then the decompressive effect of the procedure is obvious and good results may be anticipated In favourable cases, therefore, the dura cannot and must not be sutured and some form of grafting becomes necessary Myelography may indicate which type of cord will probably be found and thus help in the selection of cases for operation

In the lumbar region the same indications exist but in particular persistent nerve root pressure from spondylolisthesis is an indication for surgical intervention Newman (1955) recorded the incidence of this as 25 per cent with spondylolisthesis of L4 and 5, and 8 5 per cent for slipping of L5 on S1 Decompression in these circumstances must be followed by fusion but the results vary and the incidence of chronic back pain afterwards is unhappily high

It should be remembered that displacement in this condition occurs at the disc so that derangement of this structure is an invariable accompaniment of spondylolisthesis The posterior aspect of the disc must always be visualized for grafting alone is a poor substitute for removal of large posterior disc protrusions causing symptoms by direct pressure Spondylolisthesis with signs of nerve root pressure therefore, typifies the need for combining all three surgical methods—decompression by laminectomy removal of displaced disc tissue and fusion by grafting

Removal of intervertebral disc

The indication for operative removal of the intervertebral disc is classically persistence of low back pain with radiation and signs of nerve root pressure failing to respond to adequate conservative treatment In addition frequent recurrent attacks of spinal pain from intervertebral disc protrusion—two to three times a year—again failing to respond to conservative treatment may be considered an indication Evidence of pressure on many roots of the cauda equina or of a cerebrospinal block are absolute indications for surgical intervention and, if possible, removal of disc tissue

In such cases a large mass of sequestrated disc tissue may be found coiled up extradurally or much more rarely may finally have perforated the dura to form an intradural tumour much adherent to the roots of the cauda equina Such cases clearly merit recognition because removal is highly successful, but will require a wider form of laminectomy than the average typical case involving only one root

The usual technique of partial hemilaminectomy may suffice when the signs suggest that only one root is involved for it is not a severe procedure The mortality is under 0 5 per cent and the results are good Thus O Connell (1951) reported 92 per cent complete freedom from symptoms or some improvement in his 500 cases Post operative mobilization by graded exercises starting 1 week after operation and bed rest limited to 2–3 weeks are important measures in the prevention of nerve root adhesions

Spinal fusion (arthrodesis)

Apart from the debatable use of spinal fusion after laminectomy for decompression or after removal of disc tissue the procedure is indicated for spinal pain arising from localized intervertebral degenerative changes Again it is the failure

of conservative treatment notably immobilization by a corset which is the indication

Much narrowing of a disc space, whether unilateral or bilateral must entail telescoping of the small posterior intervertebral joints leading to their malalignment and early degeneration Radiological evidence of this added to failure of non-operative treatment may indicate the need for fusion Unfortunately, the period of immobilization for adequate arthrodesis makes this a serious undertaking economically and the incidence of pseudo arthrosis exceeds 10 per cent

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CHAPTER 31

CHRONIC ARTHRITIS

J C R HINDENACH

THE TERM chronic arthritis embraces several different pathological lesions each with its own aetiology natural history, and symptomatology, thus the need for surgery the optimum time for intervention the type of operation and the probable outcome also differ The indications for joint surgery are pain at rest and limitation of function by pain stiffness or deformity and are modified by the age occupation general physical condition and mental outlook of the patient The assessment of the value of joint surgery has been difficult because of all these variables and also because it is impossible to compare the result of an operation aimed to enable a bed ridden patient to sit in a chair or even walk with crutches with one which allows a working man disabled by a painful joint to return to heavy labour Descriptions of the results of one particular operation, without regard to the variety of diseases which may have been involved are not helpful Moreover the results obtained by one surgeon who has made a special study of a particular operative procedure may be very different from those of others

Chronic arthritic lesions may be divided into two main groups osteoarthritis and rheumatoid arthritis Still s disease (juvenile rheumatoid arthritis) and ankylosing spondylitis present surgical problems similar to those of rheumatoid arthritis

Osteoarthritis

Osteoarthritis is a gradually progressive degenerative joint lesion attacking one or several large joints with early changes in articular cartilage and bone The primary form appears without apparent cause in a healthy adult usually in late middle life Osteoarthritis may also arise secondarily following on joint trauma or previous disease or inflammation Whether the disease is primary or secondary the final pathological result is approximately the same Clinically osteoarthritis presents first with periodic aching after use with some limitation of range of movement There is gradual deterioration with increasing pain on use increasing stiffness and deformity and finally pain at rest The pain is not necessarily proportional to the radiographic changes and gross joint destruction though causing severe stiffness and limited function may be associated with little pain The pain may be self limiting and the patient able to carry on for the rest of his life without resorting to surgery Where the mechanics of the joint permit it arthroplasty (joint reconstruction with retained mobility) can produce good results

Rheumatoid arthritis

Rheumatoid arthritis is a generalized disease with widespread joint manifestations and early involvement of the surrounding soft tissues The joint lesions vary from mild recurrent synovitis through an irritative phase with painful muscle spasm and limited function to severe fibrous or bony ankylosis The disease

may become quiescent or die out at any stage Of patients under modern medical treatment watched for over 10 years 70 per cent improved or were stabilized and 30 per cent were still deteriorating An important object of treatment is to ensure that any restriction of range which occurs does so in the optimum position for function Removable splints are used especially at night or during an acute flare up

In the past surgical treatment of these joints was usually withheld until the disease had burnt itself out This is still the correct policy for some of the larger joints when major reconstruction may have to be carried out However as pointed out by Smith Petersen Larson and Aufranc (1943) a chain of undesirable reactions in the rest of the limb results from active disease in a proximal joint especially in the upper extremity For example protective muscle spasm in an inflamed painful shoulder produces adduction and internal rotation of the arm and elbow flexion thus limiting elbow and hand use resulting in permanently stiff and painful fingers It is sometimes wiser therefore to resort to surgery at an earlier stage

When the disease has died out the joint destruction and bone softening is often such as to render arthroplasty unsuccessful especially as after years of disuse and secondary scarring the surrounding muscles can never be built up sufficiently to make the new joint function satisfactorily Arthrodesis (joint fusion) then offers the best surgical solution

Still s disease

Still s disease is a progressive polyarthritis of children which closely resembles the rheumatoid arthritis of adults Removable splints must be made for all affected joints to give adequate rest relax muscle spasm and prevent contractures Surgery is only neces ary in the late case when the disease has died out The indications for operation are then the same as for joints affected by *rheumatoid arthritis*

Ankylosing spondylitis

The general tendency in ankylosing spondylitis is towards increasing joint stiffness leading ultimately to bony ankylosis The condition usually starts in the sacroiliac joints where radiographic changes give the earliest diagnosis The disease spreads up the spine leading to an immobile poker back but may become quiescent at any level Peripheral spread to the limbs may cause stiff and even arthrodesed hips knees and ankles and also shoulders and arms Remedial surgery is indicated for the stiffening joints The surrounding soft tissue contraction soon overcomes most forms of surgical arthroplasties and wide excision of bone is necessary to ensure permanent mobility A special hazard is increasing ankylosis of the temporo mandibular joints which may restrict oral intake to fluids through a tube Bilateral excision of the head and neck of the mandible may be necessary to permit jaw mobility

INDICATIONS FOR AND RESULTS OF SURGERY

The hip joint

Osteoarthritis

In a young adult (under the age of 40 years) osteoarthritis of the hip is usually of the secondary type following on Perthes disease slipped upper femoral epiphysis congenital subluxation of the hip or old infective arthritis As the disease progresses there is increasing pain and stiffness in the joint interfering first with strenuous activity or heavy work As soon as normal working life is interfered

with surgery is indicated for no conservative treatment will stay the increasing disability and the patient has many years of life ahead of him No operation which gives a movable hip can promise permanent relief of symptoms and the most certain way to cure the pain and give good function is to arthrodese the hip joint The hip is fixed in neutral rotation with no more abduction than is necessary to correct true shortening and no more flexion than arises when the patient lies flat on the operating table

The operative mortality should be nil Post operative immobilization in plaster of Paris varies from 8 to 16 weeks in the hands of different surgeons

Post operative physiotherapy is necessary for some months to mobilize the knee of the affected side, but some 90 per cent can ultimately flex the knee to at least a right angle The indications for operation recommended by Watson Jones are considerable pain hip range limited by at least 50 per cent ability to walk only a few hundred yards a normal hip on the opposite side and a normal knee on the same side

After arthrodesis of the hip the patient walks with only a slight limp Going up a steep hill may be difficult and going up stairs may necessitate leading with the sound leg at each step When sitting a mobile spine can compensate considerably for loss of hip flexion though older people with stiffer spines often have to sit on the edge of a chair Cycling or riding may become impossible and sexual intercourse may be made difficult A young person may be able to put on his sock normally while an older one may have to flex his knee fully and put the sock on from behind A stiff hip is a lesser disability to the young patient who desires activity with freedom from pain, than to an older patient who may be more sedentary

Between the ages of 40 and 60 years osteoarthritis may be primary or secondary In the primary type trauma does not seem to be a factor and a vascular disturbance is usually postulated Gross degeneration causing severe symptoms may appear within a year or two In both primary and secondary types the final disability is similar and the indications for surgery are identical

Conservative treatment should first be given a trial local heat short wave diathermy exercises with or without slings to increase muscle power and joint range, and the injection of hydrocortisone or lactic acid though they seldom prevent increasing disability Weight reduction and the use of a stick in the opposite hand together with accepting a less strenuous way of life may postpone the need for surgery and in a few cases render it unnecessary

Pain is the only indication for surgery and operation is not justified by stiffness and deformity alone There is no perfect operation for the painful stiff hip and Milch (1953) called it the unsolved problem ' It is therefore essential that the pain and disability should be so severe before operation that the condition can reasonably be expected to be better afterwards When pain is severe enough to keep the patient awake at night despite mild analgesics when there is pain at rest in a chair or pain which interferes with all activity the surgeon need have no hesitation in recommending surgery In lesser degrees of pain the surgeon should inquire into the ordinary day to day activities of the patient Can he walk a quarter of a mile without a stick? Can he climb up and down stairs? Can he carry a bag in the hand on the same side as the affected hip? Can he sit without discomfort? Is his sleep disturbed? How many tablets does he have to take each 24 hours to relieve pain? From the answers to these questions the surgeon can construct a picture of the extent of the patient s discomfort and he is then

in a position to judge whether the expected result is likely to improve the patient s condition The patient mu t be warned of the length of time required for post operative treatment and of the chances that he will subsequently have to use a stick Often the best advice for the patient is that he should use a stick and limit his activities rather than undergo surgery

Hip surgery is in an active stage of evolution and what may appear to be the best operations commonly practised at the present time should not be regarded as competing with one another Each has its place and the choice of procedure must depend on the judgment and experience of each individual surgeon

ARTHRODESIS OF THE HIP —Watson Jones (1956) recommended this operation for the 40-60 year age group Milch (1957) reported 30 per cent of intractable backache after unilateral arthrodesis though Watson Jones stated that low back pain arises from strain of the intervertebral joints from unsound fixation of a hip in a deformed position and claimed that when deformities are corrected low back pain is made better and not worse

OPERATIONS WHICH RETAIN SOME HIP MOBILITY —Patients in the 40-60 year age group usually desire some hip movement as well as relief from pain More over as time pas es their occupations may become more sedentary and then arthrodesis may not be the best operation None of the operations under this heading ensures absolute certainty of either cure of pain or good mobility All that can be offered i a reasonable chance of relief of pain Most of the operations ar of too recent origin for late results after surgery to be known

The indications for arthroplasty instead of arthrodesis of the hip should be bilateral oesteoarthritis of the hip unilateral hip arthritis with reduced function of the knee on the same side lumbar osteoarthritis reasons associated with work and o'her activity refusal by the patient to undergo arthrodesis and inadvisability of prolonged immobilization

Vitallium mould arthroplasty —Smith Petersen (1948) after many experiments with glass Pyrex bakelite and other substances found vitallium to be the most suitable substance as a mould between the refashioned head of the femur and the acetabulum The head moves in the mould and the mould in the acetabulum After operation weight bearing is not allowed until a full range of movement has been recovered The patient may start getting up with crutches and minimal weight bearing at 6 weeks but full weight bearing is not allowed under 6 months and crutches may be necessary for 2 years or more

Over 1 000 of these operations have been performed in the Massachusetts General Hospital since 1938 200 of them bilateral Aufranc (1957) reported the results for all diseases together There was no pain at all in 22 per cent of cases pain was slight or absent at rest in 31 per cent and moderate at times in 29 per cent 17 per cent were aware of the hip most of the time and 0 8 per cent suffered pain all the time Some 10 per cent suffered complications and nearly 25 per cent required secondary operations Of those operated upon unilaterally 27 per cent required sticks or crutches all the time 40 per cent part of the time and 33 per cent needed no support

Replacement arthroplasty —Judet and Judet introduced in 1946 an operation in which the femoral head was replaced by a prosthesis made of acrylic resin The operation was simple to perform and the early results were excellent though pain returned in many cas s Failures were due to the acrylic material becoming worn the stem of the prosthesis fracturing or the prosthesis becoming loosened Con tinued disease in the acetabulum could also be a source of pain Judet and Judet

(1952) reporting on 219 cases of osteoarthritis treated by this method claimed 17 per cent of excellent results 47 per cent good, 19 per cent poor, and 17 per cent bad A change from an acrylic to a vitallium prosthesis has not greatly improved these figures

Shepherd (1954) on behalf of the British Orthopaedic Association examined a large number of acrylic replacement arthroplasties at centres in Great Britain and came to the conclusion that 25 per cent of the results were poor at 1 year 30 per cent at 2 years, and 38 per cent at 3 years

Failure of a replacement arthroplasty creates a difficult surgical problem for most of the femoral head has been removed and subsequent arthrodesis is therefore difficult The present solution for a failed Judet operation is to replace this mush room shaped prosthesis by another larger vitallium prosthesis embodying an artificial femoral head and neck with a large stem passing down the femoral shaft (Austin Moore or Frederick Thompson type) This prosthesis is coming into favour for primary operations as well as after failure of the Judet procedure However, after reviewing 147 operations in 75 of which the Judet prosthesis had been used and in 72 the Austin Moore type Stinchfield Cooperman and Shea (1957) concluded that the overall results were mediocre They appear to be no better than those obtained with Smith Petersen s moulds and with femoral osteotomies though the Austin Moore prosthesis does not appear to loosen as did the Judet model

Intertrochanteric (displacement) osteotomy—In this operation introduced by McMurray (1935) an osteotomy is performed from below the great trochanter sloping at 40 degrees to a point just above the lesser trochanter The femoral shaft is then displaced inwards so that the inner point lies below the acetabulum In the modern operation an angled plate is used for internal fixation Plaster is avoided and the knee is mobilized early The patient is up on crutches in 6–8 weeks

Fixed flexion deformity of more than 35 degrees is a contraindication to this operation as pseudoarthrosis may follow Osborne and Fahrni (1950) reported on 93 cases with 3 deaths Pain was relieved in 81 per cent 23 per cent had hip flexion of more than 60 degrees and a good gait, 40 per cent hip flexion of 10–60 degrees and a definite limp and 30 per cent walked with a typical arthrodesis gait The substantial likelihood of relief of pain was the main advantage of this operation Housewives could look after their homes and men earn their living Young people could dance ride bicycles and walk several miles

Resection angulation operation—Excision of the head and neck of the femur was practised by Robert Jones and advocated by Girdlestone (1945) The procedure relieves pain at the expense of stability Taylor (1950) reporting on 93 patients subjected to this operation claimed that 87 had complete relief from pain and could walk well with the aid of a stick in spite of 1½ inches of leg shortening Passive hip flexion to 90 degrees allowed comfortable sitting Batchelor (1948) recommended the addition of an abduction osteotomy to the femur below the lesser trochanter fixed by a plate in an attempt to improve stability, but no long term results are available Milch (1953) advised a similar operation for osteo arthritis of the hip when there is inability to sit or walk without severe pain He considers it ideal in unsuccessful arthroplasties and in multiple joint involve ment as in ankylosing spondylitis

Denervation of the hip—Tavernier and Trucket (1942) partly denervated the hip joint by avulsing articular branches from the obturator nerve This proved

relatively unsuccessful for relief of pain and so through a buttock incision, the articular branch from the nerve to quadratus femoris was also divided Mulder (1948) reported on 48 cases but the results were so disappointing that the operation was discarded Temporary relief of pain in the groin in a mobile osteoarthritic hip may be obtained

BILATERAL OSTEOARTHRITIS OF THE HIP —When the disease is bilateral the indication for operation is mainly the relief of pain but gross interference with function by stiffness and deformity may warrant surgery even though pain is no more than moderate Arthrodesis of one hip and reconstruction of the other is not recommended If one hip is severely affected and the other is only slightly damaged a reconstructive operation on the worse hip should be performed Either a Moore-Thompson prosthesis a vitallium mould arthroplasty or a resection angulation arthroplasty should be used each operation having its advocates and none having any great superiority over the others Usually the amount of fixed hip deformity precludes a displacement osteotomy When both hips are severely affected reconstruction of both hips is required though the results are difficult to assess Relief of most of the pain is hoped for but many patients have to use two sticks afterwards

OSTEOARTHRITIS OF THE HIP IN THE ELDERLY —In patients over the age of 70 years with pain on taking a few steps or constant pain at rest a replacement arthroplasty will probably give the best results Post operative immobilization is reduced to a minimum and there should be reasonable relief of pain for limited use

Rheumatoid arthritis of the hip

The patient with rheumatoid arthritis of the hip is usually in an advanced stage of the disease Both hips are affected and probably the knees feet and upper limbs as well The general condition of the patient may be such as to preclude major surgery Moreover crippling of the upper limbs may prevent the use of sticks or crutches and thus reduce the value of lower limb surgery However bilateral hip disease with fixed deformity can prevent the patient from sitting and bilateral hip arthroplasty may be indicated Of all the operations aiming at a mobile joint the vitallium mould arthroplasty produces the best results though the softness of the bone may cause later collapse of the head and limited range Poor muscle power makes resection angulation operations unsatisfactory and angulation osteotomy seldom produces much increase in joint range

By the time surgery can be performed the hip muscles are so grossly fibrosed that there is little likelihood of the patient gaining enough control to enable him to walk especially if upper arm involvement precludes the use of sticks or crutches Law (1948) reviewed the results of arthroplasty in 26 patients in 16 of whom the operation was bilateral Nine revision operations proved necessary for later loss of hip movement and four further revisions for stiffness after operative sepsis Only limited range of hip flexion was achieved but many previously bedridden individuals were able to sit comfortably and to walk with crutches

Ankylosing spondylitis

Hip surgery in ankylosing spondylitis is indicated more for limited range than pain The disease may hinder walking going up stairs or sitting Local tissue reaction after vitallium mould arthroplasty or prosthesis replacement usually results in failure of the operation after a year or two Resection angulation permits

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there is much softening of bone the medial or lateral condyle of the tibia may become depressed and the limb show varus or valgus deformity If pain prevents or grossly limits weight bearing surgery is indicated Arthrodesis of one knee gives a stable limb but if both knees are involved fusion of the worse knee will enable that limb to do most of the weight bearing and thus preserve the less damaged one Arthrodesis of both knees may occasionally be necessary and is not incompatible with walking Replacement prostheses and mould arthroplasties are still in the experimental stage and no long term results are yet available Walldius (1957) has inserted an artificial hinge joint of acrylic resin and has reported on its use in 29 patients mainly with rheumatoid arthritis There were 2 deaths and 2 amputations 4 patients subsequently had to undergo arthrodesis but 75 per cent of the patients were relieved of pain and the average joint range achieved was 84 per cent of normal

The ankle joint

Osteoarthritis is usually secondary to previous fracture into the weight bearing surface of the tibia No satisfactory arthroplasty has been described Arthrodesis is indicated for severe pain and limited function Weight bearing in plaster is allow d at 4 weeks and union should be complete at about 12 weeks The subsequent limp is minimal as the midtarsal joint permits some dorsiflexion of the foot In rheumatoid arthritis the indications and treatment are similar Involvement of the subtalar and midtarsal joints can necessitate a panarthrodesis following which there is a more obvious limp

The shoulder joint

True osteoarthritis with cartilage degeneration sclerosis of bone and osteophyte formation is rare Conservative treatment by heat mild exercises hydrocortisone injections and restriction of use u ually suffice to limit pain Arthrodesis of the should r is almost never indicated and arthroplasty is unsatisfactory

Degenerative lesions in the shoulder affect mainly the soft tissues the supraspinatus tendon and overlying subacromial bursa the tendon of the long head of biceps and the joint capsule Symptoms may follow even slight injury or be without apparent cause Pain is referred to the insertion of the deltoid or the bicipital area and may present as a catch at 90 degrees of abduction on raising and lowering the arm At an early stage rest in a sling local heat and hydrocorti one injections often achieve a symptomatic cure However the lesion may progress to almost constant pain worse on use and severe at night Increasing stiffness in the joint follows from capsular infiltration and fibrosis (frozen shoulder) as well as from spasm of the adductor and internal rotator muscles Any attempts at forced movements by exercises or manipulation stretch or tear the inflamed tissues and prolong the disability Complete rest in a sling is indicated Most patients pass through a phase of pain and stiffness lasting for some months When pain subsides ordinary use of the arm is encouraged and the majority of lesions resolve completely with return to a full range of movement Manipulation under anaesthesia should be reserved for the case in which pain has disappeared but movements remain restricted De Palma (1950) stated that in the late case of frozen shoulder in which pain persists and there is loss of scapulohumeral motion down to 10–20 degrees exploration of the shoulder shows varying involvement of the biceps tendon gliding mechanism Recovery is hastened by severing

correction of fixed deformity and the degree of mobility gained is lost less rapidly than after other types of arthroplasty

The knee joint

Osteoarthritis

Osteoarthritis is an extremely common lesion in which degeneration of the articular cartilage follows the ordinary wear and tear of the years Conservative treatment with heat quadriceps exercises intra articular hydrocortisone or support, together with weight reduction and limited use give considerable relief In middle age post traumatic lesions may give rise to severe dysfunction The house wife or working man cannot carry on normal duties owing to pain which may limit walking to a few hundred yards

No satisfactory replacement prosthesis for the knee joint has yet been evolved and for a disabling unilateral lesion the best treatment is arthrodesis But a stiff knee is a considerable disability, the limp is worse than with a stiff hip stairs are difficult to negotiate, and the projecting leg can be an embarrassment when sitting It is a wise precaution before performing arthrodesis to enclose the leg in a plaster cylinder and allow the patient to discover all the difficulties in advance After operation the patient is in plaster for 4 weeks in hospital but is able to walk about in plaster during the following 8 weeks by which time the union is usually sound Magnusen (1941) prefers the operation of local debridement—that is removal of all synovial tissue menisci, osteophytes and diseased articular cartilage—and he performs it if pain persists in spite of conservative measures The operation is suitable only when ligamentous laxity is no more than moderate the patient is under the age of 60 years and of a co operative disposition for severe pain follows operation for a while Weight bearing in a brace is started at 3–4 weeks Physiotherapy has to be continued for many months Reporting on 32 patients so treated, Isserlin (1950) claimed that no patients were worse in 25 the pain was abolished or reduced 25 knees regained full extension and 27 flexed to 90 degrees or more Miller and Harris (1956) recommend the operation for obese bow legged women with painfully enlarged functionally limited knee joints Speed and Trout (1949) reported that post operatively such knees take 2 years to settle down and are not at their best until 5–7 years later they claim 60–70 degrees of movement and state that their patients walk well on level ground

Rheumatoid arthritis

In a few cases rheumatoid arthritis manifests itself in the knee joint by recurrent effusion and pain Between attacks the joint may be almost normal Provided that the radiographs show no marked cartilage destruction synovectomy is worth considering in the hope of delaying joint degeneration The operation should not be done when the joint is hot and painful A final range of movement of some 70 degrees is to be expected Occasionally in rheumatoid arthritis one knee joint may remain hot swollen and painful despite all conservative treatment An arthrotomy will show the joint to be filled with melon seed bodies or masses of soft fibrinous material The joint should be opened and the debris washed out After a few days movements are commenced and walking allowed when the skin stitches are removed Symptoms are greatly relieved and joint degeneration may be stayed for a few years

At a late stage of rheumatoid arthritis the knee joint presents only a few degrees of painful movement Radiographs show gross diminution of joint space If

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this tendon at the supraglenoid tuberosity and transplanting it to the coracoid process or bicipital groove

In rheumatoid arthritis inflammation of the shoulder joint and subacromial bursa cause muscle spasm and secondary capsular contracture with adduction and internal rotation deformity Pain may be severe enough to prevent use of the arm Smith Petersen Larson and Aufranc (1943) recommended removal of the acromion and underlying bursa in the subacute stage This gives relief of shoulder pain allowing normal use of the rest of the limb, and so preventing permanent hand and finger stiffness even though the shoulder joint movement does not greatly improve

The elbow joint

Osteoarthritis of the elbow joint is relatively uncommon and is seldom sufficiently disabling to justify surgery Occasionally a bony loose body following osteochondritis dissecans causes sudden onset of acute pain with gross limitation of movement Operative removal of the bony fragment is indicated Secondary osteoarthritis in the elbow joint following fractures or dislocations can usually be controlled by conservative treatment

The early lesion of rheumatoid arthritis is one of recurrent synovitis in the elbow joint going on to increasing pain and stiffness Protective spasm of the biceps leads to forward subluxation of the head of the radius mechanically blocking flexion Smith Petersen recommended early excision of the head of the radius, and as much synovium as possible to forestall secondary disuse changes distal to the elbow joint Late elbow arthroplasty may be necessary for bilateral fibrous ankylosis in bad position Improvement in range is to be expected but power is poor and is seldom sufficient to take the strain of crutches

The wrist joint

Osteoarthritis of the wrist joint most commonly follows fractures but is occasionally the result of previous infection If pain is sufficiently severe as to limit use of the hand arthrodesis of the wrist is indicated irrespective of the patient s age Subsequent disability is minimal

Rheumatoid arthritis of the wrists may progress from mild recurrent synovitis to fibrous or bony ankylosis Splints should be worn in the early stages particularly at night to prevent fixed flexion and ulnar deviation deformities If pain in the wrists prevents use of the hand early arthrodesis of the wrist should be performed lest permanent finger stiffness should ensue A post operative above elbow plaster is worn for 3 weeks and a below elbow plaster for 2 months Removal of the lower end of the ulna at the same time allows return of full pronation and supination of the hand

Carpometacarpal joint of thumb

Degenerative arthritis in the carpometacarpal joint of the thumb may cause painful limitation of movement and a weak grip which conservative treatment relieves only temporarily Excision of the trapezium is a relatively simple method of cure

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The writer s preference is for an oblique osteotomy of the first metatarsal neck with displacement of the metatarsal head laterally and plantarwards the plantar displacement being necessary to preserve normal weight bearing on the metatarsal head (Sharrard 1958) The position is maintained by spiking the head on to the shaft and re attaching the medial ligament more proximally A below knee plaster is applied for 6 weeks weight bearing being allowed after 2 weeks After removal of the plaster physiotherapy to mobilize the foot and toes is useful

Operations to be avoided in adolescents and young adults are removal of the exostosis which leads to rapid worsening of the hallux valgus (Bonney and Macnab 1952) and arthroplasty such as Keller s which in the absence of arthritic changes fails to relieve the cause of the disability

In adult hallux valgus whether arising as a late consequence of adolescent deformity or for the first time in middle life disability is most often due to pain from arthritis in the metatarsophalangeal joint In assessing the need for operation care must be taken to ensure that the pain of which the patient complains is not coming from the other metatarsal heads for these often prolapse into the sole as the for foot broadens and the lesser toes become clawed (Fig 3) Treatment

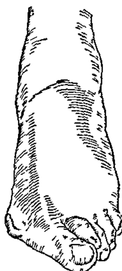


FIG 3—Severe hallux valgus and *metatarsus primus varus* A bunion has formed over the inner side of the first metatarsal head the second toe has been displaced dorsally and the extensor hallucis longus tendon is acting as a bowstring to aggravate the deformity Surgical treatment is advisable before the deformity becomes as marked as this

of the hallux valgus does little to relieve this and may aggravate it It may be that pain is arising in both sites so that the hallux valgus and the metatarsal prolapse each need appropriate treatment Increasing deformity is an indication for operation even if there are no marked clinical or radiological signs of arthritis in the metatarsophalangeal joint and especially if the great toe has deviated more than 30 degrees so that the extensor and flexor tendons are bowstringing and displacing the toe yet further A painful inflamed or recurrently discharging bunion may also warrant operative treatment irrespective of the degree of arthritis or deformity

The ideal age for operation is between 40 and 55 years Patients below 30 years should be persuaded to try conservative measures unless the signs are marked Patients who are over 65 years or have multiple deformities or show signs of rheumatoid arthritis are better treated by surgical footwear surgery being employed only if needed to allow surgical shoes to be fitted

The operation of choice is an arthroplasty in which a new joint is fashioned by removal of one of the arthritic articular surfaces Keller s arthroplasty (1904)

CHAPTER 32

PAINFUL FEET

W J W SHARRARD

IN THE management of patients complaining of painful feet, careful history taking and examination are as important as in disease of any other organ The exact site and nature of the pain its mode of onset and the factors that aggravate or relieve it must be determined The examination of the foot should include study of gait stance active and passive movements at all joints of the foot and toes muscle power cutaneous sensibility, vascular sufficiency, and general or *local swelling or tenderness*

The footwear should also be examined Deformation of the upper may draw attention to a foot deformity that would not otherwise be obvious, and the wear on the sole and heel of the shoe gives valuable information about the way weight is being borne as the patient walks

PAINFUL GREAT TOE

Hallux valgus

In adolescence and early adult life lateral deviation of the great toe almost always develops secondarily to medial deviation of the first metatarsal (Fig 3) Few adolescents fortunately complain of pain but the head of the first metatarsal becomes increasingly prominent, the bone thickens and an adventitious bursa may form on the inner side Even with care in the choice of shoes and stockings the great toe eventually starts to deviate laterally the joint articulates incorrectly and osteoarthritic changes occur in adult life sooner or later

Hallux valgus arising for the first time in an adult is usually caused by footwear *that compresses the toes Osteoarthritis in the malaligned joint produces* a prominence of new bone and a bunion on the inner side Later the first metatarsal head may be forced medially to give a clinical picture very like that described above

In some patients hallux valgus may be due to rheumatoid arthritis the clinical history and the existence of other deformities of the fingers for example are distinctive

The two indications for surgical intervention are pain and increasing deformity Pain may be either in the first metatarsophalangeal joint in a recurrently inflamed bunion or in both sites

Operation should not be undertaken below the age of 12 years and in any case only *if all conservative measures have failed In adolescence it is the* adducted first metatarsal that is the source of pain and deformity and the object of operative treatment is to restore the head of the first metatarsal to its normal position near to the second A number of operations that attempt to do this have been described and have had varying success (McBride 1935 Rocyn-Jones, 1948, Joplin 1950, Bonney and Macnab 1952) The multiplicity of techniques indicates how difficult it is to achieve and maintain correction of this deformity

a greenstick extension osteotomy of the first proximal phalanx may give relief for a few years

At any age when degenerative joint changes are visible radiologically and conservative measures have failed operative treatment must be directed to the joint The choice lies between arthrodesis in which the first metatarsophalangeal joint is excised and the two bones fused together and arthroplasty of the Keller type as described for hallux valgus Arthrodesis is more certain permanently to relieve pain on the other hand it is technically more difficult a period of 6–8 weeks in plaster is required and shoes with a low or moderate heel have to be worn afterwards It is therefore indicated in men and in younger patients while Keller s arthroplasty is reserved for women who will accept a risk of later recurrence as the price of retaining mobility at the joint Arthrodesis is contraindicated if there is a stiff or arthritic *interphalangeal* joint

In the technique of arthrodesis the writer s preference is for a sliding bone graft taken from the dorsum of the first metatarsal shaft and passed through the head

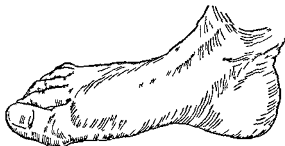


FIG 4—Hallux rigidus and metatarsus primus elevatus Weight is being borne on the plantar surface of the interphalangeal joint instead of on the first metatarsal The first metatarsophalangeal joint is osteoarthritic and enlarged especially on its dorsomedial aspect where an early bunion has formed.

of the metatarsal into the base of the phalanx the joint cartilage having been removed to give flat apposing surfaces The angle at which the toe is set is critical—15–20 degrees of dorsiflexion but not more (Bingold 1958) The results in correctly selected cases are excellent pain being relieved completely and normal function restored Delayed union or non union of the arthrodesis is a possible complication but if it occurs a technical fault is usually responsible

In patients with mild symptoms and in adolescents a metatarsal bar or rocker and a steel stiffener to the shoe under the region of the first metatarsophalangeal joint relieves pain by taking strain from the joint In those whose main complaint is of a bunion these measures may be combined with a simple exostectomy or if operation of any kind is contraindicated a surgical shoe may be needed

Subungual exostosis

Subungual exostosis is commonest in the great toe though it may occur in any toe There is a painful elevation and thickening of the nail and the tissues beneath it Radiological examination shows an exostosis arising from the dorsum or one side of the distal phalanx

Operation is always indicated The exostosis is removed under local or general anaesthetic and it does not recur if the excision has been adequate

PAINFUL LESSER TOES

Corns

Corns are always due to pressure either of the shoe on a toe or of one toe on another If the toes are deformed in one of the ways described below either the

is technically the easiest, is the least liable to late complications and allows the patient to return to normal activity in the shortest time A dorsomedial incision is used, avoiding the skin over the bunion The first metatarsal head and the proximal part of the phalanx are exposed by dissection close to the bone, and between one half and two thirds of the proximal phalanx is removed The medial aspect of the metatarsal head is trimmed fairly generously until it no longer projects beyond the plane of the shaft Suture in two layers and the application of a firm crepe bandage to hold the toe straight complete the operation

The patient should not bear weight for about 10 days After this, a gradual return to normal activity is allowed, aided by physiotherapy to mobilize the foot and toes A crepe bandage may be needed for a week or two to control any tendency for the foot to swell A normal shoe should be worn as soon as possible but the patient should be warned that the swelling at the operation site may not finally subside for 3 or 4 months and that it is not advisable to buy new shoes until after this time

Bonney and Macnab have shown that Keller's operation gives good functional results in 70 per cent of patients and fair results in the remainder The most common fault lies in the wrong selection of cases especially of those in whom metatarsalgia is the main symptom Other operations such as that of Mayo (1908), can give as good results in expert hands, but excessive ablation of bone from the first metatarsal head gives rise to serious and intractable metatarsal pain Removal of the exostosis alone as in adolescents gives poor results and is only indicated in older patients who could not otherwise be fitted with surgical shoes

Patients whose symptoms and signs are not severe enough to warrant operation should be advised to wear shoes that are wide enough to accommodate the fore foot and do not cramp the toes Splints to hold the toe straight do little or nothing to prevent progress of the deformity Pressure on an early bunion may be eased by a suitable felt ring and metatarsophalangeal pain in the great or lesser toes by a metatarsal bar to the shoe or by a metatarsal support Patients who because of age or other condition are unfit for operation need to have surgical shoes with built in supports, room for the bunion and soft but adequate toe caps to avoid pressure on the distorted toes

Hallux rigidus

A painful stiff great toe may develop as the result of an injury to the first metatarsophalangeal joint especially if there has been a fracture extending into the joint Often there is no history of injury particularly in adolescents in whom the predisposing cause is more usually found to be an elevation of the first metatarsal (Fig 4) The metatarsal head makes poor contact with the ground and weight is borne on the proximal phalanx instead Abnormal stress on the first metatarsophalangeal joint causes osteoarthritis at a very early age with pain and limitation of movement particularly of dorsiflexion Without treatment gross degeneration of the joint ensues the metatarsal head thickens and osteophytes form on the dorsal aspect over which a bunion may develop The forefoot is tilted into varus to avoid strain on the joint, and secondary footstrain may thus occur A corn usually forms under the proximal phalanx

In adolescence operative treatment is only indicated in severe cases when conservative measures have failed In such patients if there is still a useful range of plantar flexion but gross limitation of extension at the metatarsophalangeal joint

PAINFUL FOREFOOT AND METATARSALGIA

Pes planus anterior and multiple claw toes

The wearing of high heeled shoes can cause the metatarsal heads to prolapse downwards the lesser toes to claw and the fat pad under the metatarsal heads to displace forwards (Fig 5) The tendons of the intrinsic muscles of the foot come to lie dorsally and their action is reversed in tead of flexing the metatarso phalangeal joints they extend them The clawed toes are pressed on by the shoe and thus aggravates the pressure on the metatarsal heads in the sole The forefoot splays and hallux valgus may complicate the picture

In the early stages physiotherapy and avoidance of too high a heel may ease pain and correct an incipient deformity The use of a metatarsal bar or pad is also helpful. If however, clawing of the toes has become fixed an adequate metatarsal pad cannot be accommodated in the shoe nor can surgical shoes be easily made to relieve the pain

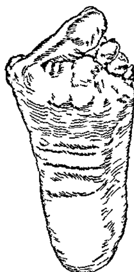


Fig 5—Pes planus anterior The middle three metatarsal heads have prolap ed towards the sole and callosities have formed beneath them The lesser toes are clawed and dis located dorsally carrying distally the pad of fat that normally lies under the metatarsal heads

Occasionally simple tenotomy of the extensor tendons is sufficient but is often followed by recurrence When the toes have dislocated and lie dorsally on the metatarsals multiple removal of the proximal phalanges is indicated but not interphalangeal arthrodeses Sometimes the toe deformity is not severe but one or more metatarsal heads come to lie almost directly under the skin of the sole and are so sensitive with marked corns or callosities beneath them that no support will relieve the pain In such a case it is justifiable to excise up to three of the middle metatarsal heads through dorsal incisions The bones are deeply placed and the operation is a tedious one

The results which surgery can achieve in this condition are limited in that the foot can seldom be restored to normal. When other measures are used as well how ver the patient can usually be made comfortable

Plantar digital neuroma

Morton s metatarsalgia is characterized by intermittent attacks of acute pain between two metatarsal heads with radiation to the corresponding toe cleft often that between the fourth and fifth toes There may be a degree of associated

deformity must be corrected the shoe enlarged or the toe protected by repeated chiropody and padding

Whenever the condition of the patient and the extent of the toe deformities allow operative correction should be carried out When sepsis is present, the coexistence of diabetes mellitus should be excluded

Hammer toe

A hammer toe is one that is flexed at the middle joint and extended at the proximal and distal ones Symptoms are due to pressure on the dorsum of the flexed middle joint

If there is a fixed deformity, it should be corrected by spike arthrodesis of the proximal interphalangeal joint The dorsal corn is excised the extensor tendon and dorsal capsule divided and the joint opened The head of the proximal phalanx is shaped into a spike and inserted into a hole made in the base of the middle phalanx Two sutures through all dorsal tissues close the wound and hold the position They are removed on the tenth day and a bandage soaked in collodion applied and retained for a further 3 weeks The patient is allowed to walk after the first week

With a sound arthrodesis cure is complete and permanent since the toe no longer projects beyond the other toes Even if bony union is not achieved a firm fibrous union is often satisfactory

Claw toe and curly toe

In clawing of a toe there is flexion deformity at both interphalangeal joints, a curly toe shows varus or valgus deflexion as well (Sweetnam 1958) Many such toes are deformed from birth In the first year of life strapping to adjacent toes may be tried but is seldom effective in many no pain ever arises because the toes accommodate to the shoes and to one another

In a few, fixed deformity develops that warrants surgical correction in adult life by arthrodesis either of the type described above or if both joints are involved by using a fine wire threaded along the phalanges to maintain the position of the excised joints for 3 weeks

Congenital dorsal displacement of the fifth toe

Dorsal displacement of the fifth toe is a congenital and familial deformity often bilateral in which the fifth toe lies dorsally and may overlap the fourth toe Pain arises from a corn either on the dorsum of the toe or between it and the fourth toe

In a child, the only admissible operation is a plastic elongation of the contracted skin extensor tendon and metatarsophalangeal capsule of the fifth toe In an adult, the same operation can be done but as good a result can be obtained by the much simpler removal of the proximal phalanx

The toe should be strapped in the corrected position for 2 months after operation The results following good correction are permanent

Exostosis of the fifth metatarsal head

An exostosis may form on the outer side of the fifth metatarsal head as part of the condition of splayed foot (*see* below) but occasionally it presents as an isolated lesion Pain and corn formation warrant thorough removal of the exostosis

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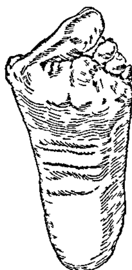


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pes planus anterior, but the measures advocated above for this give no relief except in a minority of cases

Resection of the enlarged digital nerve is indicated It can be done through a plantar incision in the intermetatarsal space where acute tenderness is found (Nissen, 1951) The result in almost every case in which a neuroma is found and removed is excellent (Nissen, 1948)

Pes cavus and claw toes

True pes cavus, associated with claw toes starts in childhood In some patients there is a detectable neurological lesion causing weakness or paralysis of the intrinsic muscles of the foot, in others a high longitudinal arch is present and seems to be a primary deformity Pain arises from excessive pressure on the metatarsal heads and on the heel

In a mild case physiotherapy and a metatarsal bar may give relief and prevent deterioration, but increase of the deformity demands surgical intervention before it becomes fixed If the clawing of the toes can still be corrected passively, transplantation of the long flexor tendon to the extensor expansion in each toe is indicated (Taylor 1951) If the clawing cannot be fully corrected multiple inter phalangeal arthrodeses are advised (Lambrinudi, 1938) Both these procedures give good correction of the clawing and partial or complete relief of metatarsal pressure

Fully developed deformity in an adult must usually be accepted and nearly always responds to a moulded cavus support Occasionally a tarsal arthrodesis with correction of the cavus deformity is necessary

PAINFUL MID FOOT

Footstrain

Pain in an otherwise normal foot may develop quite suddenly and severely usually after excessive and unaccustomed use It responds to rest and physio therapy Sometimes the pain is less marked but comes on insidiously In such a case, there has frequently been a period of immobility after an illness or the limb has been in plaster There is pain on forced passive movements of the foot joints Chronic footstrain of this kind needs manipulation of the foot under a general anaesthetic when multiple adhesions will be felt to rupture The cure is completed by a short course of physiotherapy

Before a manipulation it is important to examine the forefoot radiologically to exclude a march fracture of the neck of the second or third metatarsal in which the symptoms are like an anterior footstrain though more localized to the affected bone A hairline transverse crack or new bone formation in the region of the metatarsal neck should be treated by a temporary metatarsal pad or bar to the shoe If pain is severe or unrelieved by these measures a below knee walking plaster cast should be applied for 3 weeks

Pes planovalgus (flat foot)

Flat foot is so common in children before the age of 5 years that it may be regarded as normal (Morley 1957) The great majority of these feet cease to be flat by the time the child reaches the age of 7 or 8 years A few complain of pain in the foot or leg at the end of the day, after walking or standing The foot may appear normal when not bearing weight but rolls into marked valgus on standing

(Fig 6) and the longitudinal arch is poorly restored when the child stands on tiptoe An inside wedge $\frac{3}{16}$ inch thick applied to the heel of a well made shoe is all that most children need Some who already wear down the outer side of their shoe heel may be helped by an arch support and this is also applicable to painful flat feet in older children and adults exercises are of little value (Sharrard 1958)

Some adults in spite of an adequate support, continue to have pain in the mid foot In these radiological examination usually shows osteoarthritis in the talonavicular joint and a triple arthrodesis of the foot is indicated A tourniquet is applied above the knee then through a lateral Kocher s incision and by extra periosteal dissection the calcaneocuboid talocalcanean and talonavicular joints are exposed and denuded of cartilage so as to give well apposed surfaces of cancel lous bone Care must be taken to be sure that the foot is correctly aligned in particular avoiding a varus position A plaster is applied below the knee and is split to allow for swelling



FIG 6—Pes planovalgus (flat foot) The weight bearing foot is excessively everted and abducted so that the longitudinal arch is de pressed The navicular and medial malleolus are pro minent on the inner side of the foot viewed from behind

The plaster may be changed after 10–14 days when swelling has subsided and the patient allowed up without bearing weight A walking sole may be applied after 6 weeks but fixation is needed for 3½–4 months until union is sound The results of sound foot fusion are good in over 80 per cent of cases

Dorsal exostosis

A patient with an otherwise normal foot may present with a painful swelling on the dorsum of the medial cuneiform on which the shoe presses An underlying bony prominence is the cause If prev ntion of shoe pressure and protection by a felt ring fails to relieve symptoms the exostosis should be excised with removal of a substantial amount of bone

Peroneal spastic flat foot

Peroneal spastic flat foot is an uncommon lesion that presents in adolescence as a painful flat foot with marked and painful limitation of inversion A radiograph may reveal the existence of abnormal bars of bone in the foot (Harris and Beath 1948)

The application of a walking plaster relieves the pain It is removed in 4–6 months and if pain then recurs triple arthrodesis is indicated

PAINFUL HEEL

Tendo achillis bursitis

Pa n in the heel associated with a swelling of the bursa deep to the tendo achillis

is sometimes seen in children and young adults It almost always subsides with rest and a ½ inch raise to the heel Occasionally a chronically enlarged bursa may need surgical excision

Calcaneal exostosis

Congenital prominence of the posterosuperior angle of the calcaneum (usually bilateral) may cause a painful swelling on the back of the heel especially in girls The prominence rubs against the shoe and the skin over it thickens or a bunion forms Relief is obtained by removing the stiff back from the shoe and inserting a soft replacement A few patients with large swellings, or in whom pain persists need to have an adequate amount of the underlying bone removed If it has been necessary to remove a substantial part of the bony surface to which the tendo achillis is attached it is wise to apply a below knee plaster for 3 weeks

Plantar fasciitis and calcaneal spur

Pain in the sole of the foot just anterior to the heel is an insidious and sometimes intractable complaint The pain appears to arise, in many patients in the calcaneal attachment of the plantar fascia which shows signs of chronic strain a radio graph may or may not show a spur of new bone here

Various conservative measures may be tried—a soft rubber heel pad a support to relax the plantar fascia physiotherapy and injection of local anaesthetic or hydrocortisone If all else fails excision of the bony spur or division of the plantar fascia may be tried

Subtaloid arthritis

Osteoarthritis localized to the subtaloid joint may develop after injury, particu larly as a late sequel to a fracture of the calcaneum involving the joint If conserva tive treatment with physiotherapy short wave diathermy, manipulation and so forth fails arthrodesis of the joint is indicated

In a few cases, in which the arthritis is localized entirely to the subtaloid joint excision of this joint only suffices In the majority other joints in relation to the calcaneum are also affected and a triple arthrodesis is indicated

GENERALIZED FOOT PAIN

Tarsal arthritis

Generalized tarsal arthritis affecting most or all of the joints of the foot may arise from a number of different causes the commonest being the late effects of rheumatoid arthritis In this condition operative treatment is usually contra indicated and attempts should be made to obtain comfort with surgical footwear

In other patients a foot deformity due to a congenital talipes equinovarus or to the paralysis of poliomyelitis may become painful because of the onset of secondary degenerative arthritis These may benefit from triple arthrodesis with correction of the deformity by removal of appropriate wedges of bone

Other foot lesions

Sepsis affecting one or more of the joints or bones of the foot is occasionally seen especially in diabetes mellitus or in neurological lesions with perforating ulcers in the sole of the foot Treatment is by antibiotics and, where necessary, removal of infected or dead bone

Tuberculosis now rarely affects the foot Before the advent of specific anti biotics amputation of the foot was nearly always inevitable but is seldom necessary

any more Rest in plaster and antituberculous treatment allows the disease to resolve Pain persisting after resolution may be treated by arthrodesis of the affected joint

Gouty arthritis seldom requires surgical measures except for occasional removal of large tophi or treatment of secondary infections

Vascular insufficiency may occasionally present with intermittent claudication affecting the muscles of the sole of the foot

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CHAPTER 33

MINOR INJURIES

RUSCOE CLARKE

THE outstanding feature of injuries that can reasonably be classified as minor is their tendency towards spontaneous recovery without treatment or even in spite of treatment The chief clinical need is to sort out those requiring early specific treatment without exaggerating the importance of the trivial The time to prevent anxiety deterioration which can lead to established psychological overlay is early Much depends on the sort of explanation that the patient is given on the conviction this carries frequently on the correct choice of words and the way in which they are spoken

No attempt will be made to list all possible minor injuries Diagnosis often depends *on a knowledge of anatomy and physiology rather than of set syndrome* complexes, prognosis on visualizing what is involved in normal and abnormal repair Consideration of tissues and structures is required but also awareness that it is a limb or digit that is involved and not just bone or joint capsule

It is first necessary to divide minor injuries according to the nature of skin involvement All injuries may be regarded as wounds Skin involvement may be a trivial part of a deep wound but requires a different approach in that it provides a direct pathway for infection Even when the skin is apparently intact there are many injuries in which the risk of infection is as serious as in the obviously open wound Damaged skin may allow the passage of organisms to tissues in the depths or it may die and the slough become infected In both open and closed injuries the fear of infection has often led to an inadequate approach to the repair of damaged tissues In the minor wound deep damage is missed from fear of spreading infection whilst tissue repair in closed injuries is delayed for fear of the risk of infection In both the risk can be minimized by a full theatre routine The best time for repair of most injured structures whether the injury be open or closed is within a few hours of injury

In any case, the bugbear of minor trauma is scar tissue and two main factors contribute to its development (1) infection, and (2) failure to appose divided tissues whether they be skin ligament muscle or tendon with the result that healing takes place across a gap

MINOR WOUNDS

The importance of a wound depends on its size and depth on the extent of contamination and tissue damage on the structures involved and on its site Small wounds of the hand may damage important structures near the surface Minor scarring can be a major disability Wounds of the scalp may overlie deep damage, an infected haematoma over intact bone can lead to spreading septic thrombosis The small wound of the face may be important for cosmetic reasons Elsewhere the penetrating wound is often dangerous particularly in the region of the abdomen or near main vessels A tiny abdominal wound from a nail penknife or wire can penetrate the gut without causing any signs for many hours

A knife wound of the thigh may transect the femoral vessels with only a little bruising around the wound A tiny wound can carry clothing into a joint Such wounds need exploration which is a major procedure On the other hand pene trating wounds of the hands and feet such as may be caused by nails or screw drivers often cannot be properly explored without a lot of damage being done In the absence of evidence of damage to nerves vessels or tendons they are best treated by rest elevation observation and chemotherapy

Every open wound where damage to nerves tendons joints or vessels is suspected requires surgical exploration and supervision A wound with skin missing or seriously damaged—even to the size of a sixpence on the hands or face—may require skin grafting to prevent contraction Minor tidy wounds need cleaning and suturing unless they can be held together by bandages or butterfly strapping Such wounds and all minor abrasions are best cleaned with soap and water

A special problem of minor wounds particularly of the fingers and toes arises where primary healing fails and leaves a sinus There is a tendency to treat such a condition by antibiotics and surface dressings when the real problem is dead tissue at the bottom of the hole The treatment is surgical and involves clearing out foreign matter and necrotic tissue and this sometimes requires joint excision It may be possible to excise all scar tissue but such excision may be limited by the need to secure skin closure by suture or grafting Radical treatment for apparently minor complications can take months off the time needed for healing If a granu lating area persists after failure of primary healing early split skin grafting is always worth considering if healing is likely to take 3 weeks even if the site of the wound is such that scarring will not be important

Finally the problem of tetanus Tetanus antitoxin should not be given as a blind routine for all open wounds Reactions are not uncommon and may though rarely be fatal Prophylactic injections against tetanus need not be given for every clean superficial wound or abrasion less than 3–4 hours old Physical cleaning by gentle thorough washing will suffice Prophylaxis is recommended when wounds penetrate the full thickness of the skin and the risks of contamina tion are appreciable that is (1) wounds more than 3–4 hours old (2) wounds with clinical infection (3) wounds through skin that may have been contaminated by soil or manure—for example wounds in farmers stablemen agricultural labourers sewage workers gardeners garage mechanics football players and most children (4) deep punctured wounds however small (5) wounds in which the tissues have been devitalized Protection is particularly advisable when a trivial wound has led to deep infection (for example pulp infections which have an appreciable mortality from tetanus)

Immunization against tetanus is effective and well established but there are difficulties in the choice between passive immunization with antitetanus serum (A T S) and active immunization with tetanus toxoid which may be more effec tive and long lasting but takes time before it begins to become effective Experience during World War II showed that persons who had been actively immunized or given an effective booster dose of toxoid within 5 years of the time of injury could be satisfactorily protected by a further single injection of 1 ml of tetanus toxoid (Sachs 1952) For soldiers in a state of active immunity who carry with them a record of immunization there is no difficulty in using tetanus toxoid rather than antiserum at the time of wounding

The same recommendation cannot as yet be made for the civilian population Civilians who carry reliable evidence of earlier active immunization should be

given more tetanus toxoid when injured, but for others prophylaxis with antiserum must still be considered the proper course This is unfortunate because those who have had *previous injections of horse serum for any purpose* are liable to develop allergic reactions and occasionally anaphylactic shock when given A T S Anaphylaxis can be avoided if a small trial dose is given but patients who show a positive reaction are necessarily deprived of their prophylactic inoculation Another disadvantage in the use of antiserum is that patients who have previously had injections of horse serum retain the injected antitoxin in their circulation for only a very short time so that the administration of antiserum may be valueless (Payling Wright 1958)

The dilemma cannot be satisfactorily resolved until there is a national policy of immunization with tetanus toxoid in infancy In the meantime it is desirable that any patient who has been given an injection of horse serum for any purpose should subsequently be actively immunized against tetanus the first dose of toxoid to be given about 3 weeks after the serum injection If it is to succeed *in its purpose of ensuring that the patient shall receive tetanus toxoid rather than* antiserum the next time he is injured the immunization should be recorded on a card which the patient will carry with him conscientiously

FOREIGN BODIES

The common important metallic foreign body is the needle—the fragment of a sewing needle or of a needle broken off during injection Removal must not increase the damage One of the difficulties is that needles move around in the tissues When a needle can be felt with certainty through the skin further localization may not be necessary but when there is only deep tenderness radiological localization is advisable When the needle is certainly superficial it can be cut down on directly but operation must be performed immediately after the radiographs have been taken

Deep needle fragments require careful assessment Their radiological localization involves the use of skin markers on the limb in the position in which it will be operated upon The operation requires the deliberate exploration of anatomical layers and structures It is an exercise in surgical anatomy rather than trigonometry and requires a modicum of surgical skill and experience Because of the difficulties so often encountered the decision to explore must be taken with care The indications for removal of most small foreign bodies are their proximity to nerves, joints tendons or vessels or pain and tenderness In the first case operation means exploration of the structures in question and removal of the foreign body only when it can be easily found In the latter case the foreign body is probably surrounded by an abscess or pseudo cyst Small metallic foreign bodies buried in muscle and not giving rise to symptoms are best left alone

Wood and glass

The more troublesome foreign bodies are wood and glass the former never opaque to x ray the latter seldom *If it is suspected that glass has been retained* in the depths of a wound it is sometimes wise to get a radiograph of another piece of the glass in question to establish its radio opacity Wooden foreign bodies sooner or later produce an inflammatory reaction and it is often not until this has developed that their presence can be confirmed

CLOSED INJURIES

Closed injuries that are likely to remain closed can only be classed as minor when it is clear that damage to important structure

first place even after careful examination this often depends on an assessment of probability A minor localized injury of the foot was followed by tetanus and later it transpired that the patient had driven a garden fork through his foot 40 years previously Sprains of the knee and ankle in patients over the age of 50 years have been followed by fatal pulmonary embolism It is impossible to treat every minor lesion on the basis of a remote chance of disaster But this attitude to closed limb injury may not be applied to the trunk The early diagnosis of significant closed abdominal injuries requires suspicion of internal injury on the absolute minimum of clinical signs or symptoms

The common minor closed injuries are contusions haematomas minor fractures and injuries to joints and tendons Any suspicion of significant damage to nerve trunks or main vessels changes the category Minor injuries repay careful systematic examination

History

A detailed history is often best postponed until the nature of the problem has been revealed by primary examination Such examination for instance will speedily differentiate between a bruise of the thigh or leg where it is enough to know that it was kicked and a lesion of the knee where a careful history may be decisive in the diagnosis of a displaced cartilage A detailed history taken before the problem has emerged is often regarded by the patient as just some kind of introductory routine insufficient attention is given to questions and the answers are often inaccurate A full history at the acute stage is often most useful when the patient s immediate anxiety has been quietened and confidence established The results of examination will frequently go far in the process of reassurance and pave the way to a co operative history

Examination

Clinical examination of local injuries involves the normal routine of inspection palpation and occasionally auscultation and percussion but inspection and palpation must be carried out with the specific objective of establishing an anatomical diagnosis If the limb is tense or painful this detailed examination may have to be postponed it is sometimes only rewarding after hours or days when pain and swelling have settled Careful examination before the swelling has developed may however reveal signs that would be obscured an hour or two later

The key signs are localized early swelling genuinely localized tenderness and pain on particular active or passive movement when such pain is absent from other movements Pain on all movement may suggest a deep injury without defining its nature Tenderness that is precisely localized usually means that the site of injury lies deep to the point of tenderness and involves anatomical structures beneath that point It is possible further to test their integrity and sensitivity through a range of manoeuvres which involves the structures in question Such examination can be more precise than radiography which only shows bone The importance of the attempt to establish a diagnosis at the acute stage lies in the fact that rest is rarely indicated as the definitive treatment of a minor injury

Pathology and treatment

A full account of the pathology and treatment of minor injuries is not yet possible Many of the lesions have never been described at operation or autopsy

although much has been learned by analogy from more extensive injuries that have been explored at the acute stage The smaller the lesion the less certain is its precise pathology although an attempt must be made to construct some kind of mental picture

Minor closed injuries can conveniently be considered under a number of headings, although these tend to merge one into another

BRUISES AND HAEMATOMAS

The chief significance of simple bruising—blood extravasated into the tissues with no evident accumulation in any major pocket—is that it may indicate structural damage requiring specific treatment Once this is known or excluded, extravasated blood may be left to the natural mechanisms of breakdown and absorption Symptoms from a bruise can be eased by radiant heat massage and if deep by active exercise Widespread discoloration from minor sprains or fractures can be alarming to the patient who is usually satisfied when told that it is just the bruise coming out Haemorrhage from a moderate soft tissue tear may spread out and give no trouble or become localized and tense so that it becomes a real nuisance The growing tension does not necessarily mean continuing haemorrhage but may be due to the liquefaction of the haematoma which takes up fluid from the surrounding tissues by osmosis Most haematomas resolve without surgery with or without assistance from the physiotherapist but some do not When the content of the haematoma is obviously fluid aspiration through a large bore needle should be tried More often a safer and a more rapid result will be obtained by surgical exploration turning out of the clot and suture The dead space may be controlled by bandaging but sometimes needs a carefully applied dressing of tulle gras and wet wool gently filling in the depression

Occasionally and especially in the upper thigh there develop extensive floppy subcutaneous swellings containing plasma like fluid They are difficult to control by bandaging or aspiration but usually respond eventually to massage

The most troublesome superficial haematomas are those over the shin They may be subperiosteal and in any case may lead to interference with the blood supply of the overlying skin so that ulceration develops Surgery is indicated if resolution is delayed Sloughing or ulceration requires radical removal of dead skin and grafting

Deep seated haematomas are best treated by deep massage designed to break them up mechanically so that absorption can occur This treatment can be painful but is effective When such lesions are associated with stripping of the periosteum or a minor fracture the haematoma may calcify Once the diagnosis has been established radiographically treatment is symptomatic massage and exercises are not absolutely contraindicated With time the lump gets smaller Surgery is never indicated just because the radiograph shows a bony boss

MINOR FRACTURES

The pity about many minor fractures is that they can be diagnosed! *Unfortunately* radiology only shows the bone damage When this is trivial and the only damage it may be treated as a bruise Frequently however minor bony damage is associated with more significant injury to ligaments and soft tissues and the fracture may divert attention from the key injury When bones or joints are displaced it is often possible to deduce what soft tissue injuries have occurred It is important that the diagnosis of a trivial fracture should not lead to treatment

based on any dogmatic belief in immobilization There are certain fractures however which are minor in extent but can be troublesome and the outstanding example is the fracture of the waist or proximal pole of the scaphoid The great majority of minor fractures do not come to any harm if diagnosis is delayed The chief role of radiography i to exclude important bone injury and to assist in prognosis In many situations it is possible to decide on clinical grounds that no fracture requiring different treatment is present so that when access to radiology is difficult it can be postponed or dispensed with Differentiation between a minor and a more severe fracture may depend on the extent of original symptoms and signs and on the apparent integrity of the part as a whole as evidenced by minimal loss of function

Toes

Most fractures of the toes can be treated as bruises Obvious deformity or severe pain on movement may make radiology advisable Nail separation and skin damage may indicate that healing will be delayed and they are more important than an undispla ed fracture Those in the big toe apart such injuries require the minimum of support The bandage must not prevent the patient wearing a shoe or boot which provides the best form of protection The only additional treatment required is active exercise when pain or stiffness make walking difficult If the patient will ignore the lesion altogether so much the better Minor fractures of the big toe can be regarded similarly and radiological findings do not *necessarily* affect their treatment or prognosis Larger fractures require special care but skin damag is often more important than the bone injury

Fractures of the metatarsals without gross swelling or clinical evidence of displacement can be painful for weeks and the significance of positive radiological findings is chiefly of value in prognosis Shafts of the metatarsals are splinted by adjacent bones and soft tissues and union is not determined by treatment In fractures of the base of the fifth metatarsal union is of secondary significance It may occur slowly but the treatment is still symptomatic If the patient can walk he should do so and the more he uses the foot the sooner will symptoms subside If he cannot walk, he is best given a below knee plaster with the toes free and a walking boot *Once he has learned to walk comfortably in the plaster* it should be removed and walking exercises continued The duration of symptoms is variable but depends more on the attitude of the patient than the extent of injury

Flake fractures and other minor fractures of the tarsal bones may usually be regarded as minor sprains

Patella

In middle aged and elderly patients minor fractures of the patella are common With no displacement and a contracting quadriceps they should be treated as contusions In the absence of displacement even with moderate swelling and primary disability the fracture does not require surgery but the limb may best b treated in plaster which is retained only until the quadriceps are functioning and walking is comfortable Subsequent treatment is that of a joint contusion

Large joints

Minor fractures of other large joints cannot be considered separately from joint injuries a a whole except to say that the separation of a small flake of bone in the proximity of a joint is an indication of ligamentous or capsular avulsion and

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Fractures of the clavicle lateral to the coraco-clavicular ligament should be treated as bruises of the shoulder

Wrist

Minor fractures of the radius and ulna at the wrist without displacement do not necessarily require immobilization although protection sometimes facilitates active use Fractures of the waist or proximal pole of the scaphoid are a matter for the expert but once it is established that the lesion is confined to the tuberosity immobilization is optional union certain and treatment symptomatic The other common minor fracture of the wrist is an avulsion fracture from the back of the os triquetrum. This is a sprain but may benefit with from 3 to 4 weeks in plaster It carries a good prognosis

Hand

Undisplaced fractures of the metacarpals do not require splintage unite without trouble and are best treated by active use Angulation at the metacarpal necks warrants reduction and light fixation in the position of function but splintage or strapping should be discarded early Persistent minor angulation is consistent with a first class functional result Minor fractures of the phalanges of the fingers and thumb without either displacement or instability may require a minimum of support but this must not interfere with the function of the hand as a whole and must never be left on longer than a few weeks Older patients are intolerant of prolonged immobilization of the injured hand and immobilization must always be in the position of function—about 45 degrees of flexion of the metacarpo phalangeal joint from full extension 70 degrees of the proximal interphalangeal joint and 45 degrees of the distal interphalangeal joint for the fingers rather less for the thumb When the latter is immobilized in addition to the hand it must be in a position of opposition Major fractures of the metacarpals with displace ment fractures of the phalanges with angulation or instability and fractures involving the metacarpophalangeal joints or proximal interphalangeal joints require expert advice and frequently open surgery within a few hours of injury Fractures the extent of which would be trivial elsewhere can be of major signifi cance in the hand Optimal treatment is only possible early

This survey indicates only some of the fractures that can be considered minor It is a common mistake to assume that immobilization is indicated for every fracture Sometimes this does little harm but frequently it delays recovery or at least wastes the patient s time

SPRAINS AND LIGAMENTOUS INJURIES

Sprains and ligamentous injuries involve some of the more difficult and controversial problems of apparently *minor* injuries Severe sprains of the ankle and wrist can be difficult to differentiate clinically from significant fractures requiring specific treatment This applies equally to a proportion of injuries to the fingers In the past confusion has been increased by descriptions of torn individual ligaments which implied that joint injuries could range from tiny tears of a few fibres to total dislocation with every degree in between In fact it is nearly certain that the overwhelming majority of lesions are either sprains with partial tearing of ligamentous and capsular fibres leaving the main capsular com plex intact, or major capsular and ligamentous tears which involve much more than a single ligament A complete tear of the deltoid ligament of the ankle or

should be treated accordingly The need is to distinguish lesser conditions from major injuries which threaten joint stability

Tip of the greater trochanter

Minor fractures of the tip of the greater trochanter of the femur can be ignored and treated symptomatically as can avulsion fractures of the lesser trochanter with separation which do not need surgical repair They may require a short period of bed rest but the remainder of their treatment is by physiotherapy, with the emphasis on progressive exercise

Pelvis

While major fractures of the pelvis are of great importance because of the blood loss which may accompany them and visceral injury which may be present, patients with minor fractures of the pelvis without displacement may be mobilized early and improve rapidly with normal walking

Spine

Many fractures of the spine, in the absence of neurological complications are essentially minor although they need careful handling Wedge fractures of the bodies of the vertebrae are often not in themselves of great significance The severity of symptoms depends on the amount of combined ligamentous damage Progressive mobilization and muscular re education are decisive in their treatment

Fractures of the lumbar transverse processes may be considered minor but they are very often part of an extensive tear of the psoas muscle and can be associated with traction injuries of the lumbar plexus Symptoms may be prolonged out of all proportion to the apparent insignificance of the lesion The injured tissues are not accessible to massage but pain may be dramatically relieved by procaine infiltration

Clavicle

Fractures of the clavicle are frequently handled in such a way as to prolong the resultant incapacity With major violence and gross comminution the possibility of damage to underlying deep structures needs to be borne in mind but the majority of fractures of the clavicle occur from falls on the outstretched hand and the cervical deep fascia is not penetrated Most of these fractures unite quite rapidly with or without immobilization and though delay in union sometimes occurs the patient may be free from symptoms When cosmetic appearances are of over riding importance the patient is best treated lying flat, with a pillow between the shoulders at least for the first week When cosmetic considerations are of secondary importance however only the relief of pain and early special exercises are indicated These involve abducting both arms symmetrically with the elbows at a right angle When the horizontal plane has been reached the arms are externally rotated and the shoulders braced This exercise helps to pull the clavicle into alignment and to maintain position so that further support is unnecessary A figure of eight bandage is sometimes useful early on but should be discarded as soon as the position can be maintained actively When the arm is put in a sling the purpose of the exercise is defeated and rehabilitation takes longer Many patients treated with early active exercises are fit to return to fairly heavy work within a week or two

exclude a serious lesion Even minor lesions can be followed by gross swelling so that as time passes it is increasingly difficult to exclude major injury The absence of severe symptoms or swelling at the acute stage does not exclude a major ligamentous tear

Some consider that every major ankle sprain should be examined radiologically—if necessary under anaesthesia—in abduction or adduction in order to demonstrate opening up of the joint and the presence of major capsular damage The writer does not consider this to be necessary because if the ankle mortice is intact the strap muscles (tibialis posterior and the peronei) can be trained to take over the function of the ligaments during the process of repair The chief indication fo primary repair of the capsular ligaments of the ankle is that damaged tissues have been turned into the joint where they interfere with normal movement When this happens there is usually radiographic evidence of a slight tilt or displacement on forced adduction or abduction

In the absence of evidence suggesting fractures of the malleoli and when radiological facilities are not readily to hand the diagnosis of a sprained ankle can som times be made with safety and treatment started accordingly If there is tenderness over one of the malleoli in the absence of a major deformity fracture must be suspected but even so normal movement of the ankle minor local swelling and the absence of deformity with clinical signs on only one side of the ankle may warrant treatment as a sprain without immediate radiological examination

Majo ligamentous injury of the ankle which is only disclosed by radiography in deformity does not need surgery provided the torn ligaments are not turned into the joint With early muscle re-education the joint can be stabilized Treatment should be directed to the relief of pain and the restoration of normal function The best treatment for a sprained ankle is walking If there is gross swelling a short period of el vation and exercises may help to get it under control or a supporting bandage may play the same role If the patient cannot walk and does not wish to lie up there is no contraindication to the use of a protecting below knee plaster but the patient should be given a boot (or heel) and taught to walk on it as soon as the plaster is dry The plaster should be removed when the patient is walking with reasonable comfort usually within a week of injury With prompt attention to *all* the muscles surrounding the ankle very few sprains require prolonged immobilization If the patient is keen to return to rapidly athletic pursuits active exercises in plaster must include the evertors and invertors This is best achieved by dancing in plaster

Procaine injection may enable active exercises and walking treatment to be carried out in comfort It should only be done when the diagnosis is reasonably clear for the protective element of pain will be removed and a further fall may extend the damage

In recent years local injections of hydrocortisone have become popular for a range of painful post traumatic conditions particularly those involving joints and tendons Th writer is not yet convinced that the results are reliably better than those obtained from procaine Injection treatment gives an occasional dramatic result but in general is no more than a useful adjunct to physiotherapy and other treatment

SUDEK S ATROPHY AND CAUSALGIA

There remains an important group of apparently minor injuries which result in severe crippling disability Extreme forms are represented by the syndromes

the medial collateral ligament of the knee joint cannot take place without sufficient violence to separate the bone ends at the site of damage On the other hand if in a normal joint this does occur, ligamentous and capsular tearing always extends round at least half and frequently three quarters of the joint circumference This has been repeatedly demonstrated in operating on the knee joint and analogous conditions have been found even more frequently in exploring joint injuries of the ankle with fractures of the malleoli

There is often no correlation between clinical signs and the extent of deep damage The clinical distinction between sprains and extensive capsular and ligamentous damage is important since, when the latter is diagnosed early surgery may be indicated particularly in the knee joint and the hand This allows ligaments to be sutured so that they remain ligaments whereas when gaps are left they are filled in by fibrous tissue which has quite different properties Surgery frequently reveals the fact that major portions of ligaments capsule and periosteum are turned into the joint or rolled out Union under conditions of conservative treatment produces a mass of scar tissue which may stretch and lead to instability or become a source of pain and limitation of movement Sometimes this ligamentous damage extends into muscle attachments particularly at the elbow Late repair of major capsular injuries is rarely satisfactory and replacement of ligaments by tendons or fascia lata does not give results comparable to those of immediate repair

The different problems arising from injuries to different joints depend to a considerable extent on the details of the joint anatomy and function The shoulder joint is protected by a double layer of enveloping muscles Sprains are usually sprains of the muscles and dislocations are a separate problem Major ligamentous damage of the elbow is often associated with primary dislocation or with a fracture of the head of the radius which in itself is minor The extent of the soft tissue injury is sometimes indicated by a depression above the medial epicondyle due to muscle tear Genuine sprains of the elbow do not respond to forced movement of any kind Major sprains of the wrist occur more often than has been generally accepted Persistent pain and tenderness without bony injury may require careful clinical evaluation

In the knee a major capsular tear can be demonstrated at the acute stage by angulation on attempted abduction or adduction This should be confirmed radiologically which will show opening up of the joint on the affected side This is a major injury and requires surgery or *full plaster immobilization* *Initially* the extent of swelling or the amount of pain may obscure angulation particularly if the joint cannot be extended In this case examination under anaesthesia with radiographic control may be needed When the knee joint is obviously stable and there is no suspicion of cartilage injury the diagnosis of a sprain may be made from local tenderness and pain on attempted abduction or adduction Local tenderness frequently indicates the site of a minor lesion of the structures around the knee joint Treatment is by quadriceps exercises and progressive use immobilization is unnecessary even when partial ligamentous damage tears off flakes of bone The persistence of local tenderness unrelieved by physiotherapy warrants the injection of a local anaesthetic

Sprains of the ankle are extremely important because of their frequency Within a short time of injury it is sometimes possible to make a fairly accurate clinical diagnosis Pain and tenderness confined to the anterior part of the lateral ligament of the ankle joint with no tenderness on the inner side no tenderness over bone no apparent deformity and free flexion and extension may be enough to

CHAPTER 34

ELECTROCONVULSIVE TREATMENT AND LFUCOTOMY

ALICK ELITHORN

INTRODUCTION

BOTH electroconvulsive treatment (E C T) and psychosurgery are therapeutic methods used only with patients who are severely disturbed emotionally Both are powerful treatments which may produce profound changes in the psychological organization of the patient and which may determine changes in behaviour that are disturbing both to the patient s relatives and to other members of his society These treatments although physical in character are thus generally undertaken while the patient is under the care of a physician with special experience in psychological medicine

However as Watts (1957) pointed out it is not only inevitable but perhaps preferable that a great deal of psychological illness should be treated without a specialist psychiatric opinion Thus it is still true that many patients who would benefit from these specific treatments are not referred or are referred late to a psychiatrist either because the symptoms are not recognized as psychological in origin or because it is thought that they are of a type which will not respond to any form of specialized psychiatric treatment

Failure to recognize the need for E C T can lead to much unnecessary suffering both for the patient and for his relatives and occasionally to suicide and homicide The benefits of leucotomy also are sometimes denied to suitable patients because this form of treatment has not been considered or because of ill informed prejudices Leucotomy is not a common treatment but may produce brilliant results It should not be undertaken lightly or without careful consideration of all the implications by a psychiatrist with special experience of the different types of operation

In addition to dealing with the problem of the patient for whom a chance of effective treatment may be overlooked the general practitioner or the specialist has at times to deal with patients for whom E C T or leucotomy is clearly the treatment of choice The patients and their relatives will be greatly helped if the doctor in whom they already have confidence understands the mechanisms of these treatments and is abl to discuss the likely results and the risks involved In the present chapter therefore the general principles underlying the choice of these treatments will be discuss d in greater detail than the precise indications or the various modifications which have been developed

MODE OF ACTION OF ELECTROCONVULSIVE THERAPY

The effectiveness of E C T is not now seriously disputed There is however less agreement about the mechanism by which improvement is brought about The th ories put forward are of two types—physiological and psychological

of Sudek s atrophy and causalgia The former combines certain radiological changes said to be characteristic with gross stiffness and circulatory inadequacy This is probably best regarded as the established end result of the operation of a number of factors, including delayed tissue healing prolonged inflammation excessive scar formation with incidentally, a delayed reversal of the bone reaction to injury The contribution of prolonged plaster immobilization is not proved Early venous obstruction leading to swelling and organization of interstitial fluid *probably plays a decisive part The established clinical picture rarely develops* without some early indication that all is not well Careful attention to all com plaints of pain or swelling in plaster or a bandage which may be tight are probably the most useful steps in prevention Careful timing of release from fixation and progress of movement may be equally important

Causalgia is a painful complication of major or minor nerve injuries, essentially it is an altered pattern of cortical response to a nerve lesion usually incomplete It mostly affects the area supplied by the median nerve particularly following finger injuries treated by amputation or healing with scar The risk is minimized in amputation by the clean division of nerves and accurate suture without tension Painful lesions associated with nerves caught up in a skin scar and involved in deep fibrous tissue require early assessment and careful treatment If pain is unrelieved an established causalgia may result Vibration treatment and Novocain blocks are sometimes decisive Scar resection neurolysis grafting and re amputa tion are only successful when carried out before a new pattern of reaction of the cerebral cortex has become established Psychological factors must be considered but the primary objective is to secure normal use of the affected part as early as possible This alone can ensure that the altered balance of nerve impulses resulting from anatomical injury is prevented from becoming a permanent pattern of painful response

CONCLUSION

Many conditions have of necessity been omitted from this discussion particu larly those which have received full attention in the literature The aim has been to review a variety of minor injuries not normally regarded as particularly ' inter esting *In conclusion it is important to be constantly aware that two serious* conditions may follow injury or mimic its local signs—osteomyelitis and polio myelitis In children in particular any suspicion of a febrile illness should bring them to mind Even without this they should be suspected early Very young children often react to local injury by simple inhibition and apparent total inability to use the limb in question They require most careful repeated observation

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At the end of this period of readjustment the patient will still have a residual organic cerebral defect Unless this is very small it will entail appreciable changes in his psychological disposition or personality It would be wrong to argue that because this operation leaves a scar or defect in brain tissue the psychological changes are necessarily also a defect or that the personality must be scarred Leucotomy is undertaken not only to abort mental illness but also to halt a vicious spiral of maladjustment and personality deterioration The change in personality may be in some cases clearly for the better

EVALUATION OF PERSONALITY CHANGE

The evaluation of a personality change is always a subjective one and depends on the viewpoint of the observer In a series of 103 patients almost all of whom were seen in out patient practice 26 reported unfortunate changes in personality and 15 reported changes in personality which they regarded as beneficial (Elithorn and Slater 1956) Unpleasant changes included increased irritability (12) emotional flatness (11) lack of energy or laziness (7) intellectual impairment (6) tactlessness (5) loss of self assertiveness (3) lack of personal tidiness (2) lack of self confidence (1) One woman claimed she was now able to assert her own ideas more than before Unfortunately these were Christian principles relating to the status of coloured people and she asserted them at bridge parties in South Africa Since this embarrassed her husband and she herself regretted it the tendency was recorded as a personality deficit under the heading of tactlessness Another woman, who became less preoccupied with her own symptoms now complained of greater sensitivity to those of others her husband s uncouth eating habits particularly distressing her

Of 15 patients who reported beneficial personality changes only one thought that there had also been some bad effect These favourable changes are mostly classifiable as increased stability of affect and a reduced liability to unpleasant emotional reactions Increased self-confidence increased confidence in others and increases in energy initiative and interests were also mentioned A patient who had several years of orthodox psychoanalysis claimed that the operation had made him more adult and less narcissistic

As might be expected bad effects were recognized more readily by the relatives —irritability lack of energy laziness and tactlessness being reported by relatives twice as often as they were mentioned by the patients In 2 cases where the relatives complained of the emotional unresponsiveness of the patient the latter recognized this and regarded it as an asset Although the relatives reported unwelcome changes in 55 per cent of the patients they thought that on balance 75 per cent had been helped and that in 42 per cent there had been great improvement Only in 2 cases did the relatives and patients both think that the operation had made the patient much worse

Attempts have been made to classify the changes in personality which follow frontal lobe lesions in terms of damage to a single psychological mechanism Thus Jarvie (1954) claimed that the main frontal defect is a disinhibition It has been asserted that all changes are secondary to loss of the ability to take an abstract attitude The frontal lobe serves many functions and because it lacks unwarranted precision the present author prefers the formulation of Russell (1948) that these areas of the brain enable the individual to exploit his emotional capacity to provide the necessary drive for learning and creative thinking It is perhaps the frontal lobes which enable the glutton to become a gourmet and

The most likely explanation is a physiological one, namely, that E C T stimulates or releases from inhibiting influences the hypothalmic centres con trolling autonomic and visceral functions According to this theory it changes behaviour by activating the energy determining or drive determining mechanisms rather than by altering the controlling or integrating functions of the brain Action replaces inaction decision indecision and the patient looks towards the future rather than to the past The burden of guilt disappears hope displaces regrets and both psychological problems and external difficulties are once again taken in a stride that is longer and more vigorous An alternative theory postulates that E C T acts by disrupting the neuronal connexions underlying recently organized patterns of behaviour This permits the re emergence of less neurotic pre morbid reactions to stressful situations A less precise physiological theory suggests that a generalized disruption of cortical activity leads to mild confusion and difficulty in concentration and hence to a period of rest from psychological worries

Psychological theories deal with the significance of the treatment to the patient It is seen by some authors as a punishment which relieves guilt, or as a symbolic death which permits rebirth A less dramatic interpretation is that E C T provides a situation more threatening than the psychological difficulties which the patient s illness enables him to avoid Certainly E C T sometimes has a powerful suggestive effect One patient cured dramatically of an hysterical illness by a single shock returned 10 years later with a recurrence of symptoms, again to be cured by E C T (Pratt 1958)

At various times each of these mechanisms may play some role in the total therapeutic effect but there can be little doubt that the main value of E C T is related to its power to abort a depressive mood change of the endogenous type That is to say, it has a specific effect in depressions which have their basis in a physiological defect and are largely independent of the organization of the individual s personality

MODE OF ACTION OF LEUCOTOMY

Psychosurgical operations on the frontal lobes have two physiological con sequences First they produce irreversible destruction of certain fibre tracts or cortical areas Secondly they produce transient changes at a distance—diaschisis That is to say the normal patterns of activity in various nerve centres particularly in the thalamus and the hypothalamus are disturbed by an abrupt reduction in the afferent impulses both excitatory and inhibitory which come from the frontal regions Similarly the afferent pattern to the frontal lobes themselves is abruptly changed This diaschisis may be likened to the shock effect of E C T in that it can abort a mood disturbance of the endogenous depressive type This effect is an immediate and transient one and is distinct from the permanent change in psychological organization which is produced by the organic defect Just as transection of the spinal cord may be followed by several months of shock and flaccidity so may cerebral diaschisis lead to a prolonged period of functional disorganization Clinically confusion may last only a few days but changes in personality may still be occurring 18 months to 2 years after leucotomy This period of gradual physiological readjustment provides an opportunity for psychotherapy habit training and other rehabilitatory procedures an opportunity which is often only partially utilized

completely denied Often the patient relates his depression to a specific symptom "if only this could be cured he would be his normal cheerful self Depression of this sort not infrequently occurs post operatively or after childbirth At first the preoccupation with residual *symptoms and the problems of readjust*ment is regarded as reasonable later when the disability persists and is clearly excessive it is dismissed as hysterical or neurotic when in fact the cause is a depression Careful inquiry however will generally reveal some of the symptoms discussed above Equally important an interview with a relative will disclose that this is not the patient s characteristic psychological reaction to a physical disability or psychological stress of this degree Sometimes a therapeutic trial of mylobarbitone and *dextroamphetamine sulphate may decide the issue* In cases of doubt and where incapacity is real a trial of E C T *will be justified*

The presence of a psychological cause for a depressive illness is not in itself a contraindication for E.C T provided the depressive reaction is not mainly determined by continuing anxiety It is important to remember that severe agitation is not uncommon in depression and that a depressive illness may simulate an acute anxiety state However where the anxiety is not secondary to the depression E.C.T may aggravate the condition It is because E C T does not relieve and may increase underlying anxiety that some depressive illnesses respond better and more permanently to leucotomy These are the depressions in which anxiety or obsessional ruminations related to real or imaginary fears either maintain a depression of the endogenous type or cause frequent relapses Such cases are commonest at the involutional period and during senescence Where a long standing and crippling depressive illness is determined primarily by a patient s excessive tendency to anxiety or obsessional thinking leucotomy may be indicated as the only possible treatment *In manic* depressive disease leucotomy should be used with *caution It* will rarely prevent a recurrence though the symptoms of subsequent attacks *will be attenuated* Occasionally a leucotomy seems to precipitate an intractable and persistent *manic* or *hypomanic* state

States of excitement

In states of acute *uncontrollable* excitement of schizophrenic or manic origin E C T has at times been *life saving Its* mechanism of action is unknown for in hypomanic states it often increases *excitement* However the effectiveness of a combination of chlorpromazine and amylobarbitone in *controlling excitement* without *depressing* vital functions to a dangerous extent means that E C T is now rarely indicated *Similarly the* advent of chlorpromazine has made it unnecessary as well as unethical to use *leucotomy as a* nursing procedure

The schizophrenias

Although E C T may be valuable in cases of acute catatonic stupor or excitement neither this treatment *nor leucotomy has* been shown to have any specific effect on the schizophrenic process E C T may relieve a depressive element or catatonic stupor leucotomy may permit the patient to be less *preoccupied* with and bound by his abnormal thoughts Intensive or regressive E C T as a basis for a psychological repatterning in schizophrenia has not become accepted as an effective treatment

Personality disorders

E.C T has no *permanent effect* on personality organization and is therefore indicated almost only when there is *an intercurrent* depressive illness Occasionally

the gourmet an epicure *They add richness and complexity to both the emotional* and intellectual life

While the character of the changes in personality brought about by leucotomy is determined both by the site of the damage and the past experiences of the *individual certain changes are typical* The fatuous, euphoric dementia described as the classical frontal lobe syndrome only occurs with extensive damage With small lesions only minor personality changes will occur There will be a reduction in the capacity to worry that is to develop anticipatory tension or anxiety Ruminative preoccupation with past or future events will give way to responses related more directly to environmental stimuli Emotions will become shallower and less persistent and there will be some reduction in planning ability

INDICATIONS FOR E C T AND LEUCOTOMY

The modes of action of E C T and leucotomy have been discussed The specific indications for each of these treatments can now be related to the main psychiatric syndromes

Depressive reactions

In spite of the strictures of Garmany (1958) and the doubts expressed by Lewis (1956) it remains helpful to classify depressions into those which are endogenous and those which are exogenous in type (Mayer Gross Slater and Roth 1954) The former are conceived as reflecting a physiological depression of the hypothalmic centres which control the autonomic nervous system Exogenous depressions are attributed to environmental events or psychological beliefs Here the depressive reaction is related to anxiety This in turn may be secondary to aggressive or sexual feelings of which the patient may not be completely aware Mixed cases where a physiological depression is initiated or maintained by environmental stresses are not uncommon Similarly in a depressive illness which is primarily endogenous the psychological picture may be coloured by hysterical obsessional or anxiety symptoms Such symptoms may sometimes so preoccupy the patient that depression is denied or related entirely to physical or environmental *difficulties*

In endogenous depressions—the depressive phase of manic depressive disease involutional depression and some post operative and puerperal depressions—E C T has a specific effect A common attribute of all these depressions respon *sive to E C T is that although they may have been triggered off by a psychological* trauma a physical illness or an operation their subsequent course if the patient s personality is taken into account is independent of or disproportionate to environmental events Certain symptoms some of them physiological in character are typical of this form of depression

Characteristically the patient has relatively little difficulty in getting off to sleep, but wakens early perhaps at 3 or 4 o clock in the morning He is worse in the early part of the day and is slow in both thought speech and movement He is preoccupied with imaginary bodily ailments frequently related to the alimen tary tract He feels hopeless is filled with guilt and tends to relate the cause of his illness to his own folly or sin Preoccupation with guilt about masturbation or sexual misdemeanours is common While a typical retarded endogenous depression can hardly be overlooked *it is sometimes very easy to miss a mild* underlying depression when the main symptoms are essentially hypochondriacal or obsessional in character and depression may not be mentioned or may be

COMPLICATIONS AND CONTRAINDICATIONS

Electroconvulsive therapy is now almost always given in ' modified form The epileptic discharge is induced while the patient is anaesthetized and under the influence of a muscle relaxant This technique and the principles governing the spacing and termination of treatments have been described by Sargant and Slater (1954)

There are no absolute physical contraindications to E C T Each case must be decided on merit the chances of eventual benefit being weighed against the possibility that the patient may die or be made worse The main contraindications are acute upper respiratory infection a recent coronary thrombosis or severe heart failure Hypertension in itself should not prevent treatment where this is strongly indicated So-called maintenance E C T is now rarely called for b t it is worth recording that one patient with an aortic aneurysm has received over 250 treatments (Wolford 1957) The anaesthetist who gives the treatment should always be told what drugs the patient is having for instance physostigmine grea ly prolongs the action of some muscle relaxants No food or drink may be taken for 4 hours before treatment

The commonest complication of E C T is some minor impairment of the powers of memory and concentration With more than one or two treatments this effect can confidently be expected and the patient should be warned that this is a normal consequence of treatment With almost equal confidence he can be ass red that these functions will fully recover within a few days of the completion of treatment Occasionally these difficulties persist more rarely they are severe and there is no doubt that the risk of a persisting memory disturbance increases progressively with the number of treatments A mild hypomanic reaction is not uncommon rarely this develops into a full blown manic psychosis Amenorrhoea commonly a d impotence occasionally are transient complications The mortality is between 1 in 10 000 and 1 in 15 000 treatments

It is now unusual to recommend a major or standard leucotomy in the first instance exc pt in cases of malignant growth Here the price of a definite person ality blunting must be paid if worth while relief from pain is to be achieved In all other cases a minor operation mav prove adequate and if not the immediate response will generally and ca e whether a more extensive operation will later prove worth while Which modified operation should be selected ? In practical terms the specific indications for a dor al topectomy or undercutting have not been proved hence an operation in the orbital region is generally preferred and it is best to choose that in which the surgeon has the greatest experience and confidence

With leucotomy the mortality rate is about 1–2 per cent while a further 3–5 per cent of patients suffer a cerebral haemorrhage which is of sufficient extent to be clinically detectable and which sometimes determines an appreciable post operation personality deterioration Epilepsy occurs in 2–5 per cent of cases A mildly fatuous and euphoric reaction normally occurs immediately after the operation and in recurrent manic depressives an intractable manic or hypomanic state may occasionally result from leucotomy Irr tab lity outspokenness tact lessness and some loss of the ability to display affection are common during convalescence Relatives often find these symptoms disturbing They should be warned that they may occur and should be encouraged with the knowledge that with the modified operations they will largely pass away Sexual or ethical difficulties are uncommon partly because these aspects of social behaviour are

it may be used for its suggestive effect or its psychological significance dramatized However, hysterics are prone to perpetuate the discomforts and amnesia of the recovery stage and even to elaborate the transient confusion into a persisting state of derealization or depersonalization Since E C T frequently increases anxiety it is used in the personality disorders only with great caution

The main effect of leucotomy on personality is a reduction in ruminative pre occupation and in anxious fore thinking In severe intractable obsessional states leucotomy should always be considered Occasionally brilliant results are obtained Where ritualistic behaviour such as hand washing is entrenched the prognosis for operation is less good but where the patient is preoccupied with fears or the pattern of ritual remains labile the outlook is better It is probably best of all in those cases where there is a vicious spiral of obsessional anxiety depression and morbid preoccupation Often these patients react to E C T either with only transient improvement or with an increase in anxiety In such cases leucotomy may break the spiral and initiate a progressive trend towards recovery

Severe psychoneurotics whose main symptoms are those of anxiety often show considerable improvement However a residual level of anxiety is inevitable if the patient is not to show severe personality defects and in the consulting room these patients often admit to little change and sometimes deny quite real improvement In such cases the relative may reveal that the patient is more active and has regained interest in affairs other than his symptoms these, in fact being diminished both in strength and frequency Not infrequently, the change in personality which occurs will be recognized both by the patient and relative as entirely for the better

Hysteria, psychopathic behaviour and drug addiction will occasionally respond to leucotomy since these symptoms sometimes reflect underlying morbid fears and anxieties Each case must be considered on its merits and as the operation increases the tendency to react hysterically to stress careful pre operative assessment must be undertaken to ensure that tension is in fact an aetiologically important factor

Somatic illness

For a short time leucotomy was regarded as an important advance in the treat ment of intractable pain It is now known that leucotomy does not permanently raise the threshold for the perception of pain and unless marked emotional blunting is deliberately produced it will not relieve the patient with frequent and severe attacks of physical pain Where however the pain is physically *less severe and the patient is crippled mainly by fear and depression* good results are often obtained Thus leucotomy should be used in the treatment of pain only exceptionally and then as a method of treating the secondary psychological reaction rather than the primary symptom Similarly patients who are exclu sively preoccupied with or excessively depressed by some other physical defect may sometimes be greatly helped by leucotomy Where this defect causes a severe and inescapable physical incapacity as with severe torsion spasms the results are likely to be unsatisfactory Where the incapacity is less real as in the intractable depression which sometimes accompanies tinnitus the results may be dramatic (Elithorn, 1953)

In the present state of our knowledge of autonomic functions leucotomy should only be used in psychosomatic illnesses such as ulcerative colitis when it would be justified independently by the patient s psychiatric state

CHAPTER 35

HYPOPHYSECTOMY

E J RADLEY SMITH

JOHN HUNTER at the end of the eighteenth century seems to have given considerable thought to the effects of castration upon the prostate gland but it was not until 100 years later that White in the United States of America tried to control benign prostatic enlargement by orchidectomy Just afterwards Beatson (1896) reported amelioration in two cases of carcinoma of the breast by oophorectomy and a decade later irradiation of the ovaries was tried for the same purpose Cade (1954) pointed out that irradiation in present-day dosage though it arrests uterine bleeding but little affects oestrogen secretion and surgical castration is consequently coming back into favour

The next step was the use of androgens and oestrogens in the late 1930s In 1945 Huggins removed the adrenal glands for the treatment of advanced prostatic carcinoma The experiment was a failure because at that time replacement therapy was not possible but more lasting success followed when cortisone became available in 1951 Attack upon the master gland the pituitary was imminent Indeed its destruction by irradiation had already been attempted in 1935 by Dobrin and Luciman for diabetes mellitus but the highly differentiated pituitary cells appear to have great resistance to irradiation Later implantation of various radioactive substances was employed Olivecrona of Stockholm was the first to use surgical removal of the pituitary gland on any large scale for the treatment of various diseases other than tumours of the gland itself Luft Olivecrona and Sjögren (1952) reported on the value of the operation in a number of general medical conditions notably diabetes mellitus and Luft and Olivecrona in 1955 on its effects in carcinoma especially of the breast

THE USE OF HYPOPHYSECTOMY

Carcinoma of the breast

As yet hypophysectomy has been employed only in patients with widespread recurrences or in those who come for treatment when the disease is clearly already beyond the scope of either local surgery or irradiation Experience in the treatment of such patients has now convinced the writer that although many extensive lesions can be benefited by hypophysectomy there is a point at which the disease is too advanced to respond In the past oophorectomy at the time of primary removal of the breast cancer has often been advised but hypophysectomy has not been performed or even seriously suggested at this early stage However now that successful post operative management is combined with an assurance of regression in a reasonably high proportion of cases the time has come when the question must be put—how early should hypophysectomy be performed?

In the selection of cancer patients for hypophysectomy obviously the most important consideration is that the tumour should be hormone dependent Unfortunately there is no test at present by which we can tell in advance that a

determined more by habit than by thought or passion and partly because any decrease in inhibition is balanced by a decrease in initiative and persistence

THE ETHICS OF PHYSICAL TREATMENT IN PSYCHIATRY

Patients are sometimes deprived of the benefits of E C T or leucotomy because they their relatives, or their own doctor regard these treatments as unethical When this position is based on religious belief it is in general determined by a failure to understand the moral issues involved

As far as Roman Catholic ethics are concerned leucotomy when it is used with due care is perfectly lawful (MacCarthy, 1949) Neither the Church of England nor the Council of the Free Churches makes authoritative or binding announcements on matters of this kind As the Rev A R Vine, General Secretary of the Free Church Federal Council pointed out (1958) Christian thinkers draw a distinction between the immaterial spirit of man and the material mechanism through which it functions Sometimes the objection is made that leucotomy is ethically unlawful because the operation involves the deliberate destruction of healthy tissues Even were this the case leucotomy would come within the law of double effect (Bentley 1955) Similar considerations apply to E C T

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of improvement along with the metastases and large malignant ulcers in the breast sometimes developing when no more irradiation can be given have responded well, filled up and epithelialized

Carcinoma of the prostate

Carcinoma of the prostate can in certain circumstances be profitably treated by hypophysectomy As in carcinoma of the breast the standard methods of treatment such as orchidectomy and stilboestrol are employed first When stilboestrol no longer controls the lesion or when intolerance to it has arisen hypophysectomy should be considered Multiple bony metastases with severe disabling pain have responded well when other methods no longer held the pain in check It is the writer s present impression though based on a smaller number of cases that carcinoma of the prostate responds at least as well as carcinoma of the breast to hypophysectomy

Diabetes mellitus

Some forms of diabetes mellitus and some of its complications have often been treated by hypophysectomy The young diabetic with severe retinal changes leading to blindness is probably the most suitable type Indeed Luft Olivecrona and Sjögren when first reporting the results of hypophysectomy in 1952 described its eff cts in such cases It was in these also that the earliest experience of irradiation of the pituitary gland was gained Large numbers of diabetics have been treated by hypophysectomy in Stockholm though as yet few in Great Britain Luft pointed out that after hypophysectomy the visual failure progresses for a short period before being arrested It has been the writer s experience that in those patients in whom diabetes has co existed with carcinoma the hypophysectomy de igned for the treatment of the latter has much benefited the former

Acromegaly

Irradiation of the pituitary gland is already often employed but cases are frequently met in which severe headache persists despite maximum irradiation and the facial changes so often very disfiguring in a young woman are not much affected by this treatment even though it is otherwise successful Operation is sometimes necessary in acromegaly for the relief of headaches or because enlarge ment of the gland or adenoma is pressing on the visual pathways Hitherto opera tion has been limited to removal of the adenoma and although often successful in removing the immediate pressure effects it did not in general reverse the skeletal or facial changes Only total hypophysectomy could be hoped to control eosino philic activity when this was widespread throughout the gland but this procedure was not contemplated previously when replacement therapy was not available Armed with the knowledge gained from the control of patients after total hypo physectomy for carcinoma the surgeon may now with confidence undertake this procedure for acromegaly It has resulted in reversal of the facial disfigurement narrowing of the gaps between the teeth and so on and is therefore recom mended when operative treatment is demanded by persistent pressure and other effects

Malignant exophthalmos

One need hardly mention that the extent of proptosis bears no very constant relationship to the degree of thyrotoxicosis in toxic thyroid gland disturbances

growth will respond to this operation Some information may be available from the response which has been observed following previous administration of andro gens or oestrogens, or on the effects of oophorectomy or adrenalectomy When these have been good there is some ground for supposing that hypophysectomy may also give satisfactory results, but this is by no means certain Also good remission after hypophysectomy has been known to follow previous failure to respond to other methods of hormone therapy

Results

The results from most large centres agree and show that somewhat more than 50 per cent of patients may be expected to show improvement after hypophy sectomy but even in those classified as unsuccessful, relief of pain is commonly marked even though objectively the lesion is not improved In successful cases in which pain has previously been a prominent feature for example patients with metastases in bone the relief of pain is usually dramatic and often those who required heavy medication with opiates before operation require none at all afterwards It has been suggested that this is a kind of leucotomy effect resulting from traction or thrombosis affecting the frontal lobe, but this is clearly not the case for patients who have had hypophysectomies may subsequently complain of pain of different origin such as toothache appendicitis and so on The relief of pain is sometimes so quick that an immediate alteration of tension within the deposit must be envisaged, perhaps by reduction in its water content Another outstanding effect of hypophysectomy in these patients is the increase in general well being

In the writer s experience metastases have an equal chance of improvement after hypophysectomy in whatever tissue they lie, the degree of their regression depend ing only upon the ' hormone dependency of the primary always provided that ablation of the pituitary gland has been complete or nearly complete This view is not universally held Luft Olivecrona and Sjögren (1952) for example still consider that hepatic secondaries do not respond well It has to be admitted that when an organ is already excessively damaged little good may result from causing the metastases in it to shrivel up Intracranial deposits have a special place in the assessment for by their bulk and pressure effects they may preclude an intracranial operation requiring such deep access Olivecrona has advocated the removal of a solitary cerebral metastasis as a prelude to hypophysectomy but all too often the metastases in the brain are not solitary Some degree of pituitary suppression by prednisone may secure transient shrinkage during which operation may be performed Metastases in the lungs also seem to have the same response as other metastases but the respiratory difficulty may greatly increase the risks of anaesthesia and operation These risks have been reduced by the use of hypothermia during anaesthesia The site of metastases is then no bar to a favourable response to hypophysectomy with the exception of the mechanical impediment of cerebral ones

Some earlier writers expressed the view that patients over the age of 60 years were unlikely to improve after hypophysectomy The contrary view has also been expressed, for example by Ray and Pearson (1956) The writer has observed no diminution of response in the older group of patients and though some series give the impression that premenopausal women have the better chance of improve ment it cannot be denied that many excellent results are obtained in women well past the menopause The primary lesion when still present has an equal chance

The approach from above is usually made on the right side to avoid retraction of the dominant cerebral hemisphere for retraction of one hemisphere is essential in order to reach a midline structure as far back as the pituitary gland The eleva tion of the necessary osteoplastic flap in the frontal area is often made difficult by hyperostosis frontalis interna so common in women at or after the menopause The dura is opened and the frontal lobe elevated from the floor of the anterior fossa Tumours of the hypophysis elevate the optic chiasma and are more simple to remove than the normal gland

Sometimes when the gland is far back in relation to the optic chiasma its removal is virtually impossible and the surgeon has to rest content with severance of its stalk Although this disconnects the hypophysis from most of its vascular and nervous connexions with the brain a few blood vessels enter it at the sides and these are probably responsible for the fact that this operation is not always so successful as complete ablation In the great majority of cases the whole gland is removed though usually in several pieces Nevertheless however thorough the surgical removal may appear to be it should be supplemented by the insertion of radioactive material in the apparently empty fossa so that any remaining cells adhering to the capsule may be killed

The routine use of hypothermia has greatly facilitated the management of patients during and after hypophysectomy and all are agreed upon the smooth post operative recovery which follows it Though shrinkage of the brain is its most important effect there is also lessening of blood loss and transfusion is not required

POST-OPERATIVE CARE

Considerable diuresis follows operation and fluid replacement with intravenous saline solution is used 100 mg of hydrocortisone being added if there is any serious hypotension The administration of cortisone is always commenced on the day before operation even if adrenal gland function is normal but a pre operative estimation of adrenal gland function is essential in all cases as insuf ficiency may be present owing to destruction of the glands by metastases Much larger doses are then required especially if adrenalectomy has been previously performed Most patients after operation require 25–50 mg of cortisone daily for the remainder of their lives

Except in those patients previously adrenalectomized the post operative manage ment is usually not difficult, and those with experience both of adrenalectomy and of hypophysectomy emphasize the superiority of the latter in this respect After the post operative tests to check the loss of pituitary gland function have been completed thyroid is given in daily doses of up to 0 2 g (3 gr) otherwise the need of it is painfully obvious The repeated fits which used to occur after hypophysectomy have been eliminated altogether by phenobarbitone and this is continued in doses of 30 mg (0·5 gr) 3 times a day for 6 months after operation

If cortisone and thyroid are taken permanently in correct dosage as shown by the post operative tests patients can in favourable cases lead an active life The writer has a male patient who was bedridden with painful bony metastases from a prostatic carcinoma who since hypophysectomy has been working as a railway guard A young woman severely dyspnoeic even at rest from pulmonary meta stases from a breast carcinoma has returned to part time nursing duties

Hypophysectomized patients should be warned of the need to seek advice con cerning cortisone dosage should any infective illness arise as the need is then increased They can withstand other operations subsequently for patients have

Indeed, some of the most severe cases of exophthalmos are found after thyroidectomy and in the presence of a basal metabolic rate which is not greatly raised. The thyrotrophic hormone of the pituitary gland is believed to be responsible and hypophysectomy is a rational procedure. The radical decompression of both orbits recommended by Stallard and Jackson is often successful in securing considerable relief of the forward displacement of the eyeballs, but when both orbits are affected, as they so commonly are, the removal of the pituitary is a less formidable surgical procedure than bilateral orbital decompression.

Chorion carcinoma

Chorion epithelioma in the female, when primarily affecting the uterus, may be associated with an enormous rise in urinary gonadotrophin—sometimes to the extent of one thousand times the normal. Hypophysectomy commonly results in a large reduction of the urinary gonadotrophin and although the exact mechanism of the rise in chorion carcinoma is not fully understood, it would appear that hypophysectomy may have a place in the treatment when the lesion arises in the uterus, even if it has none in those arising in the testis or ovary. Luft reported one successful result in a young woman treated by hypophysectomy.

Other uses

The writer has had no success in cases of disseminated melanoma although there is some theoretical justification for hypophysectomy in this condition. Luft had the same unsatisfactory response. Likewise in carcinoma of the ovary hypophysectomy has yielded no good result. Luft claimed one successful result in a non-functioning carcinoma of the thyroid gland.

THE TECHNIQUE OF ABLATION OF THE PITUITARY GLAND

Radiotherapy

Practice has shown that total or even subtotal destruction of the gland is difficult to achieve with such doses of distant irradiation as can be used with safety. Many attempts have therefore been made to implant radioactive substances such as gold and yttrium in the gland. In spite of much to recommend it the method has two dangers. First, it is difficult to obtain uniform necrosis of the gland unless some of the radioactive material is placed high in the fossa, and when this is done there is danger of damage to the visual pathways. Cade and Lee (1956) reported such damage in 6 out of 21 cases treated by intranasal introduction of radon seeds into the sella turcica. Secondly, these methods carry the risk of cerebrospinal fistula into the nose which can later result in meningitis.

Surgery

The inferior or transphenoidal route to the pituitary gland was at one time widely used. The intrasellar part of the operation took place within the capsule of the adenoma. The upper part of the normal pituitary gland is surrounded by the subarachnoid space, and if it is approached from below there is a greater risk of fistula after hypophysectomy than when only a pituitary tumour is removed. The use of a fine beam of protons may have a place in future therapy if the appropriate apparatus becomes more widely available. In Great Britain ablation of the whole gland is usually practised from above. In the Gothenburg school an interesting approach through the antrum has been evolved.

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Hypophysectomized patients should be warned of the need to seek advice concerning cortisone dosage should any infective illness arise as the need is then increased They can withstand other operations subsequently for patients have

been known to survive laminectomy, appendicectomy, and drainage of abscesses When fresh symptoms arise there is a natural tendency to attribute them to a recurrence of the carcinoma but there are now sufficient people alive and at home after hypophysectomy for ordinary disease to be encountered among them and one must be watchful not to miss some easily curable condition by wrongly ascribing the symptoms to recurrent cancer The difficulty may be accentuated by the masking effect of cortisone in febrile illnesses

It has already been indicated that for technical reasons absolutely complete removal of all pituitary gland tissue is difficult However, although this is aimed at studies have shown that survival of a small amount does not prevent a successful result Many tests of completeness of removal have been employed but probably the most useful are tests of thyroid gland function and these must be performed during a period of withdrawal of cortisone therapy

MORTALITY AND MORBIDITY OF HYPOPHYSECTOMY

Operative mortality depends greatly upon the selection of patients for operation Moreover, since carcinomatosis is the main indication the average patient must be a poor risk If almost all these desperate problems are to be accepted and the patients given some chance of relief then an operative mortality as high as 15 per cent must be expected

Operative morbidity when the subfrontal route is employed is not high the only frequent complications being polyuria and damage to the sense of smell Adequate retraction of the frontal lobe without traction on the ipsilateral olfactory tract is difficult and the writer has considered it safer to divide this tract deliberately This step has incidentally demonstrated the extreme fragility of the tract and may provide an explanation for the frequency of anosmia in closed head injuries Even when the left tract has been seen to be intact at the end of the operation anosmia has sometimes followed There may be gradual recovery or the loss may be permanent

Diuresis very often follows hypophysectomy and this is probably not on account of the loss of the pituitary gland but of damage to the hypothalamus when dividing the pituitary gland stalk Diabetes insipidus does not indicate completeness or otherwise of pituitary gland ablation The condition is of immediate onset in 80 per cent of cases but most patients have a degree of diabetes insipidus at some time during the post operative course In the great majority of cases the polyuria falls below the level of inconvenience in 6–12 months In the minority with continuing symptoms injections of Pitressin Tannate have proved satisfactory

CONCLUSION

The burden of surgical hypophysectomy is a heavy one and any method lightening the load would be acceptable In the past methods of ablation without open operation have largely been conducted from below It may be that the use of a stereotaxic machine would permit coagulation or the accurate implantation of radioactive material in the pituitary fossa from above with lessened risk of fistula and infection Should this method prove as reliable as surgical removal it might enable more cases to be treated However pituitary gland ablation by whatever method cannot be considered to be on a rational basis until some pre operative test is evolved to predict which patient will respond and the discovery of such a test is the subject of urgent research Closely akin to the problem of non response is that of eventual relapse after early good effect At present it is not even known

whether the neoplastic cells acquire the ability to thrive anew in the altered hormonal environment or whether some quite other explanation is the true one. Light may be thrown on the problem by selective suppression of different endocrine glands by the administration of appropriate chemical preparations now becoming available.

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CHAPTER 36

THE PLACE OF SURGERY IN LOSS OF VISION

HENRY HOBBS

VISUAL LOSS uncomplicated by other manifest disabilities, commonly results from a lesion of the ocular tissues, and a discussion of surgical treatment is concerned principally with ophthalmic surgery It must be remembered, however, that whilst this is true of the majority of cases a significant proportion of blindness results from lesions which involve the optic nerve and intracranial visual path ways Statistics of the registered blind (Sorsby, 1953) illustrate these facts and whilst they show that the afflictions of old age—cataract macular degeneration and chronic glaucoma—are responsible for the greater proportion of all cases registered they reveal optic atrophy as the largest single cause of blindness among individuals becoming blind under the age of 51 years (Sorsby 1957) Many of the cases in this last group arise from causes at present unknown, but it is signifi cant that the largest group of known origin is attributed to the effects of intra cranial tumours Of these a high proportion were probably not amenable to treatment however the frequency of severe visual loss from potentially remedi able lesions affecting the optic chiasma—for example pituitary neoplasms and aneurysms—is sufficiently high to merit attention to such causes when the surgery of visual loss is being considered Especially is this so when the risks of exploratory craniotomy in expert hands have been so reduced as to warrant intervention on a purely visual indication

Acute bilateral loss of vision is due less often to ocular disease than to rapidly increasing pressure upon the chiasma from the sudden expansion of a tumour in its vicinity Such a catastrophe does not occur often and sudden blindness is more commonly seen when insidious loss of vision in one eye has passed unnoticed until its fellow also becomes affected either by ocular disease or involve ment of the visual neurones Signs of ocular disease are absent when the cause lies behind the eye although pain in the eye may be a prominent symptom when the lesion involves the fifth cranial nerve Perception of movement can usually be elicited in some part of the visual field when the initial shock has passed but the localizing value of the field loss in such cases is usually small Acute uniocular loss on the other hand results from a lesion of the eye or optic nerve Whilst this may occur unaccompanied by pain in or external abnormality of the eye—for example in such vascular lesions as occlusion of the central retinal artery large macular haemorrhages or in cranial arteritis—in many cases the character of the pain and the appearance of the eye are of diagnostic importance

When the vision of both eyes is affected insidiously through disorder of the visual pathways the resulting defects of the visual fields are of great localizing value, and may precede by a considerable period other evidence of for example intra cranial tumour Ocular lesions producing the same effect can usually be diagnosed with certainty when vision is seriously affected but whether the cause be a neuro logical one, such as a pituitary tumour or confined to the eye—for example

cataract glaucoma or macular degeneration—its effects are commonly asym metrical Thus what may appear at first sight to be unilateral optic atrophy can often be recognized as the result of pressure upon the chiasma though frequently only after careful examination of the field of the fellow eye Similarly detailed examination of the contralateral eye itself is called for when a manifest cause for the visual impairment is apparent in only one eye

It is evident therefore that the problem of visual loss inevitably involves consideration of ocular orbital and intracranial lesions and that treatment in some cases will come within the province of the neurosurgeon Such causes will *not* be dealt with further in this chapter which will be confined to certain prominent ocular causes of visual loss

TRAUMA

Trauma is probably the most important single cause of acute loss of vision and even a slight blow without perforation of the tissues may have serious con sequences Traumatic glaucoma from intraocular haemorrhage is by no means uncommon a retinal detachment may occur in an eye which has not apparently sustained any injury and sympathetic ophthalmitis from superficially unimportant limbal injuries is still seen Since such damage can only be assessed with the aid of special instruments it is advisable that a specialist s help should be obtained whenever any doubt exists as to the presence of an ocular injury

GLAUCOMA

Primary glaucoma results in blindness in a large proportion of cases and was responsible for 13 8 per cent of those registered blind in 1950 (Sorsby 1953) There are two principal forms of the disease the clinical features of which differ considerably and it is essential that the diagnostic distinctions be clearly appre ciated if preventive and remedial measures are to be effective The greater number of cases are of the chronic simple form which tends to affect older people but the congestive type although it is responsible for fewer cases has a broader age incidence and may therefore cause more enduring incapacity

Congestive glaucoma

Congestive glaucoma presents the more acute clinical picture with ocular injection corneal oedema discomfort or pain and blurred vision associated with a rise of intraocular tension Premonitory attacks which are mild and resolve spontaneously often precede the severe acute attack in which the need for urgent treatment is obvious Here blindness from retinal ischaemia will ensue unless the intraocular tension is promptly reduced and this forms the urgent thera peutic aim Drainage of the aqueous from the anterior chamber angle must be increased either by the intensive use of miotic drugs such as eserine pilocarpine or di isopropyl fluorophosphonate (D F P) or if these fail by surgical methods within a few hours Reduction of aqueous secretion either by means of acetazola mid (Diamox) or by intravenous hypertonic solutions is a useful adjunct to this main line of treatment

Chronic simple glaucoma

Chronic simple glaucoma offers a more insidious and therefore a more danger ous threat to vision Its effects are apparent in an eye which may appear externally normal and in which the tension does not approach the levels seen in congestive

glaucoma, until the late stages when vision is irretrievably damaged Symptoms are less urgent and may consist of indefinite ocular pain exaggerated presbyopia or the awareness of field loss Glaucomatous atrophy of the optic nerve is progressive, affects first the fibres of peripheral vision and finally those serving the macula and results in increasing cupping of the optic disc Such changes are irreversible, but the progress of the condition may be halted by medical treatment with miotics, or by surgery

Indications for surgery

In general the indication for surgery is the failure or impending failure, of medical treatment In congestive glaucoma this is apparent when minor congestive attacks persist in spite of medical treatment or when the acute attack is uncontrolled A fistulizing operation or an iridectomy is indicated if miotics are ill tolerated by the patient, if the patient intends to travel out of reach of expert surgical care, or if one eye is already blind and operation is considered to offer the greatest chance of safety for the second

In chronic simple glaucoma, failure of medical treatment is less obvious for the condition may progress with, at first little or no detectable change in tension For this reason constant supervision is called for so that the earliest signs of visual loss—small scotomas in the central fields of vision—may be detected and treatment varied accordingly Various tests are under trial for the early detection of impaired drainage but none of these has yet supplanted careful perimetry

Results of surgery

The results of the surgical treatment of glaucoma depend very largely on the stage at which it has been applied Timely intervention in congestive glaucoma may be depended upon completely to restore vision in a large proportion of cases In chronic glaucoma however the irreversible damage already sustained by the time the patient presents for treatment is often great and though the condition may be stabilized it cannot be improved

RETINAL DETACHMENT

In primary retinal detachment the embryonically distinct posterior pigment layer is separated by fluid from the layers anterior to it Retinal detachment has become amenable to surgery since the discovery by Gonin (1920–29) of the part played by holes and tears in the anterior layer in allowing intraocular fluid to find its way between these two layers of the retina If untreated this separation inevitably progresses Central vision is lost when the macular area becomes involved and ultimately complete detachment occurs If the retinal hole is located in time surgical treatment has a substantial chance of effecting a cure The bleb of fluid is evacuated and the edges of the hole are sealed to the underlying choroid by an area of aseptic choroiditis usually produced by diathermy

The duration and degree of the detachment are all important in determining the possibility of surgical cure Once the macula has become detached the chances of restoring central vision are remote although a useful field of vision may be preserved Other factors affect the prognosis such as high myopia the quadrant of retina affected aphakia (from previous cataract extraction) and associated ocular damage in traumatic cases On the average the prospects of cure are between 50 and 60 per cent and in selected cases figures as high as 80–90 per cent

have been recorded (Stallard 1944 Shapland 1948) Surgery may be contra indicated by associated ocular disease or because the period of immobilization necessary in many cases before and after operation is considered too dangerous on account of the patient s general condition

CATARACT

Cataract makes the largest single contribution to the blind register and in 1948-50 was responsible for over 30 per cent of all new registrations—a fact which is very hard to understand in view of the efficacy of present day surgical treatment No less than 80 per cent of the patients registered were certified as having had no treatment yet only 8 5 per cent were considered by the certifying doctor to be incurable 28 per cent as doubtful and 31 2 per cent as remediable Evidently unwillingness to submit to treatment played an important part in the decision that these individuals were to remain blind There is no doubt that many patients are afraid of an operation which in the past has been performed solely under local anaesthesia The known incidence of complications has also given rise to fear especially that of sympathetic ophthalmitis the risk of which has however been greatly exaggerated There is also the popular belief that a period of complete blindness must precede and may also follow operation and for this there was some basis in past practice when maturity of the cataract was insisted upon as a necessary prelude to surgery When operation was performed only by the extracapsular method a long period without useful vision was inevitable With the general adoption of the intracapsular method this is no longer so and the patient may now be encouraged to seek treatment on the score of his disability without awaiting maturity of the cataract It is to be hoped that when the diminished unpleasantness and risks of modern methods become more widely known at least those patients considered remediable will avail themselves of the benefits of surgery and that many patients previously considered doubtful will be able to be provided with useful vision

Opacification of the tissues of the embryo is a normal accompaniment of growth, but one by which the cornea lens and vitreous alone of the body tissues remain unaffected Preservation of their essential transparency is achieved by a complex physiochemical metabolic balance the full nature of which is as yet ill understood which in disease conditions may become precarious and disturbance of which can lead to opacification It is not surprising therefore to find that of the many vicissitudes which beset the foetus *in utero* some—presumably toxic—result in congenital cataract Certain disease processes which produce a profound disturbance of metabolism—for example diabetes mellitus or hypoparathyroidism—are also complicated by lens opacities and the sclerosis which accompanies ageing affects the lens so that transparency becomes translucency and this with added disorder may be converted into opacity In addition to such generalized changes intraocular disease and especially disease of the adjacent iris and ciliary body provides an even more potent threat to the lens Thus to the congenital metabolic and senile opacities which form the majority of primary cataracts must be added an appreciable number of so-called complicated cataracts which are secondary to such disease

The process of complete opacification of the lens following the first appearance of subcapsular nuclear haze or of localized opacities in different areas varies greatly in the different types Many of the localized congenital opacities lie off the visual axis and do not interfere with vision until sclerotic changes intervene in later life others affect the central portion of the lens at an early ag but in most cases progress is slow Metabolic cataracts on the other hand may appear with great rapidity as in acute diabetes mellitus although most cataracts seen in diabetics arise as an acceleration of the common sclerotic changes of senility appearing in the fifth and sixth decades Senile cataract itself whilst it usually occurs later than this and progresses slowly shows marked variations in its development and the effects of the

opacity on vision are thus somewhat irregular it may be almost mature and apparent as an opacity on superficial inspection when vision begins seriously to fail but it often produces a marked disability when the opacity is still circumscribed lying in the posterior part of the lens and visualized with certainty only by means of the slit lamp microscope

All these facts have an important bearing on treatment Operation is usually indicated when the visual handicap becomes onerous, but before this stage is reached much can be done by way of palliation of associated visual disturbances When the opacity lies posteriorly reduction of vision occurs relatively early If, however, it is central and lies more anteriorly two added effects are observed first, vision may be poorest in bright light when the pupil is constricted and the opacity therefore occupies a greater proportion of its aperture secondly, dazzling or halation may be caused by light falling on the opacity and scattered by it Both these effects may be reduced to some extent by the wearing of dark glasses, and the use of mydriatics (atropine) is sometimes justifiable though these must be employed with caution because of the possibility of mydriatic glaucoma Mydriatics are therefore, most useful in congenital cases where this risk is least Dazzle, although to some extent ameliorated by dark glasses is better avoided by the proper placing of reading lamps behind the patient and by the wearing of brimmed hats or eyeshades Changes in the refractive properties of the lens substance produce myopia and astigmatism for which frequent changes of glasses may be required

In acute metabolic cataract, prompt medical treatment of the cause may stay, and at times appears to reverse the progress of opacification In cataracts secondary to iridocyclitis treatment of the primary condition is all important and an essential preliminary to any considerations of surgery Medical treatment of associated disorders although it seldom has any effect on the cataract is a valuable preparation for surgery, and the stabilization of diabetes mellitus the reduction of chronic cough, the treatment of urinary disorders and the control of hypertension all do much to reduce the incidence of post operative complications

Indications for surgery

Surgery may be advised for primary cataract as soon as there is serious loss of visual acuity When there is maturity of the cataract or complete opacification of the lens the indications for operation are more pressing, for after this further changes in the lens proteins result in hypermaturity a condition involving much greater operative risk to the eye In advanced congenital cataracts seen shortly after birth the two indications arise together whereas in the majority of cataracts appearing in later life severe visual loss precedes maturity by a period varying from months to years The choice of time for operation depends somewhat on the technique to be employed

Extracapsular extraction

In extracapsular extraction the anterior lens capsule is incised and the contained cataractous lens matter is removed The operation results in the retention of a certain amount of immature cataract adherent to the intact posterior capsule and this by interaction with the aqueous becomes gradually if incompletely absorbed to leave a thin opaque layer the capsular membrane or after-cataract This must later be incised by capsulotomy (needling) before clear vision is possible The duration and severity of the process of absorption depends largely on the amount of residual lens matter remaining after the extraction Pre-operative maturity therefore has not only

the technical advantage of greater ease of extraction but results also in a shorter interval between extraction and capsulotomy with earlier recovery of vision An advantage of the operation of more academic than practical importance is the fact that the vitreous face is not exposed and for this reason, complications from vitreous loss would be expected to be fewer On the other hand the method involves a second operation which is not entirely without risks (Goulden, 1948) and these must be taken into account when considering the relative merits of the alternative techniques Such considerations as these have led to the development of the intracapsular method of extraction by which the cataract is removed complete with its capsule at a single operation

Intracapsular extraction

In racapsular extraction requires operative manoeuvres of rather greater delicacy than does the extracapsular method and since it involves the deliberate exposure of the vitreous face it used to be feared that complications would arise more frequently The obvious advantages which it offers have however led to its adoption in an increasing proportion of cases and with the enlarged experi ence which this has brought complications have been reduced to very small proportions

B fore World War II the intracapsular method was employed in only a small minority of cases at Moorfields Eye Hospital, London However by 1950 it was being used for 30 per cent of extractions (Annual Report 1950) and the report for 1954 showed a further swing in its favour the two operations being described as evenly balanced By 1956 the number of intracapsular operations was double those performed by the older method It is evidently now the treat ment of choice and it is in terms of this operation that the prospects of visual recovery can usually be discussed with the patient when the question of surgery arises

Extraction is applicable to the majority of cataracts in middle life and later L ns opacities in the young however are usually the result of trauma or have a congenital basis and in these intracapsular extraction is usually precluded by the stronger lens *zonule* Discission is usually practised and this may have to be repeated on more than one occasion if absorption is incomplete Alternatively the process may be hastened in young adults by curette evacuation, by which much of th. lens matter is removed through incisions in the cornea and anterior lens capsule

In a large proportion of these cases only one eye is affected and binocular vision is only possible by the u e of a contact lens for the aphakic eye or with one of the types of acrylic implant which have recently been introduced Even without them however the increased field of vision even though blurred when the cataract has been absorbed presents a considerable advantage and diplopia seldom results

Anaesthesia

Cocainization of the cornea renders it quite insensitive and anaesthesia of the intraocular tissues is obtained by the retrobulbar injection of local anaesthetic Temporary paralysis of the eyelids by injection of the facial nerve is commonly used to prevent blepharospasm unless curarization is employed. The advantages of general anaesthesia are to some extent offset by the fact that should any sneezing coughing gagging or vomiting occur after it they may raise the intraocular pressure and lead to serious operative or post-operative complications However the advantages of operating upon an unconscious patient are manifestly great and special anaesthetic techniques suited to ocular surgery have therefore been developed in recent years Combinations of basal narcosis and local anaesthesia offer particular advantages in

this respect and the Largactil pethidine technique described by Burn (1955) has been found to provide excellent operating conditions for both surgeon and patient

Such developments are clearly of great importance in that they enable surgery to be offered to patients who would otherwise be too apprehensive and unpredictable to co operate in an operation performed under local anaesthesia and sedation alone

Complications

Ocular complications of cataract extraction estimated by Stallard (1950) as occurring in 4 per cent of cases mainly occur in the early post operative period Iris prolapse delayed wound healing and re formation of the anterior chamber, expulsive haemorrhage hyphaemia and infection are the chief of these The incidence of the first four has been much reduced by the general adoption of wound suturing Antibiotics and steroid therapy enable infective complications to be controlled to a large extent and since such early complications constitute the majority of those seen they seldom prejudice the visual result when treated promptly

Of the late complications sympathetic ophthalmitis is the most serious It is however exceedingly rare and although it may involve the sacrifice of the eye, the favourable effect of steroid therapy upon the few cases which have arisen since the introduction of this form of treatment has enabled eyes to be retained with useful vision Retinal detachment is less uncommon, but still affects less than 1 per cent of cases (Glover 1954) and whilst aphakic detachments are less amenable to diathermy repositioning, scleral resection offers somewhat greater hope of retaining useful vision Aphakic glaucoma occurs in some 1–1 5 per cent of cases and may seriously affect the result if surgery is not available or miotics fail to control the condition but the increased incidence which was at one time forecast for this complication with the intracapsular operation has so far failed to materialize

The general complications which occur with any frequency after cataract extraction are usually seen during the immediate post operative period in hospital They arise very largely from the need for immobility and for the bandaging of both eyes for a time in an aged patient, and consist of pulmonary conditions such as embolism, congestion and bronchopneumonia also mental disorders with delusions and hallucinations which often have a visual basis and retention of urine Prophylactic pre operative investigation as has already been mentioned is valuable Perhaps the most important single measure in avoiding such com plications is the reduction of the restrictions imposed by complete bed rest and bandaging of both eyes which has been made possible by the greater freedom allowable when the ocular wound has been adequately sutured It is now therefore possible for nursing procedures to be carried out with the patient in a sitting position within 24 hours of operation for physiotherapy to be used soon after wards and for him to be allowed up within 3–5 days of operation where this is desirable on general grounds Forty eight hours is usually the maximum period of bilateral bandaging and where even this restriction is proving harmful the period may be further reduced Diabetic complications which are likely to be encountered since so many cataract patients are diabetics are usually fore stalled by careful pre operative preparation and constant post operative control

Results of surgery

The patient s satisfaction with the result of this operation is related to his visual needs rather than to any arbitrary standard of visual acuity In most

cases this means the ability to read fine print and distance vision as acute as before the cataract developed Such a result is achieved in expert hands in a majority of cases De Roetth (1955) from a survey of modern reports found satisfactory results generally approaching 90 per cent and whilst Glover (1954) referring to cases treated at Moorfields Hospital over one year reported satis faction in only 66 per cent of all cases it is clear that this series included an unduly high proportion of poor risks which if excluded leaves a figure of 84 per cent If the less rigorous criterion of useful vision is applied (and this implies vision adequate for the needs of the individual) the proportion of successful results rises to 96 per cent (Stallard 1958) Whilst it is evident that acute reading vision is invaluable to the aged literate patients who form a large proportion of cataract subjects it must be realized that improvement in vision which is less than perfection either because of coincident retinal disease or other ocular factors will yet in the vast majority of patients be sufficient to remove the visual handicap which has immobilized them and permit some form of literate recreation or occupation

Aphakic vision

In the majority of patients to whom vision has been restored by cataract extraction the temporary strangeness of aphakic vision is soon compensated for by increased clarity but alterations in perspective and early difficulties with the judgment of distance may at first be found trying by elderly patients This particular difficulty is worse if only one cataract has been removed and return to normality will be accelerated by removal of the second

Contraindications to surgery

Contraindications to cataract extraction arise in the eye itself and in the general condition of the patient The principal ocular contraindication is a cataract secondary to some ocular disease which from its presence may render extraction too hazardous to be attempted without fear of subsequent serious complications nullifying the result such as *active uveitis* or which from its very existence makes visual improvement impossible *Cataract* secondary to retinal detachment is an example of such a contraindication Nevertheless whilst active uveitis precludes extraction it must be remembered that when the active phase has passed and the eye has become quiet under treatment the remaining cataract may be cautiously extracted with prospects of a useful visual result

General contraindications to operation arise in patients who are uncooperative or very feeble or who suffer from such chronic diseases as hypertension diabetes mellitus or pulmonary disease However these are only relative bars and may frequently be overcome by selection of a suitable technique of anaesthesia or of operation and nursing posture and by careful pre operative preparation if necessary in the general words of a hospital

OPACIFICATION OF THE CORNEA

Keratoplasty

Opacification of the cornea produces severe visual loss and may be caused by almost any of the pathological conditions which affect this part of the eye It is seen for example with such congenital conditions as conical cornea after keratitis and ulceration of every type from trauma and with the various obscure types of corneal dystrophy Such lesions are responsible for only a small proportion

of those registered as blind in Great Britain, but whereas the major causes tend to affect principally the later age groups, blindness from corneal disease is more evenly distributed and its disabling effects therefore, extend over a greater period of life The density of the opacity varies widely according to the nature and severity of the primary condition, but it is, of course, its site in relation to the centre of the cornea which principally determines its effect upon vision Gradual changes in density occur spontaneously, but once an opacity has become established the chances of visual recovery are poor

The history of experimental keratoplasty extends over a century but it is only during recent decades that the possibilities of the operation have been realized to an extent which has removed corneal grafting from the experimental stage to one in which the operation is capable of reliable clinical application in selected cases The chief indication for keratoplasty is the visual loss due to the opacity and its most dramatic results are seen when this can be completely removed and replaced by a graft consisting of the full thickness of the cornea However the beneficial effects upon adjacent diseased tissue of a partial thickness (lamellar) graft are such that in many cases useful vision can be restored more safely in this way These therapeutic effects of a lamellar graft may indeed, be used to promote healing in chronic intractable keratitis and may thus prepare the way for later visual improvement with a second graft Such a graft may, in the case of a perforating corneal ulcer in the acute stage provide the only alternative to enucleation Thus therapeutic as well as visual considerations have an important place among the indications for keratoplasty

Having in mind, therefore the very varied nature of the corneal opacities which present and the differing objectives of keratoplasty, it will be seen that any review of the indications for operation would be beyond the scope of this chapter These must depend upon a precise assessment of the individual lesion, associated ocular pathology and the dominant surgical aim and it must suffice to say that the possibilities of corneal surgery must be considered before the disability is accepted as irremediable

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CHAPTER 37

THE MANAGEMENT OF SQUINT

HENRY HOBBS

STRABISMUS is a manifest deformity in which the visual axes deviate from the normal position of parallelism. Such malposition is evidently the result of abnormal action of the extraocular muscles and in many cases defective movement of the eyes indicates a structural defect of these muscles However in a large group of cases other visual defects are present and the belief that muscle defects are the primary cause of strabismus in all cases is held now only by a shrinking minority

DEVELOPMENT OF THE BINOCULAR REFLEXES

Knowledge of the stages through which normal binocular vision develops in the infant and of the evolution of binocularity in the animal kingdom has shown that the mechanism by which the two eyes are controlled and co-ordinated to achieve the high degree of stereoscopic vision found in the human adult is a delicate and complex one It arises in the early stages as an unconditioned reflex response to primitive stimuli originating in purely somatic organs is later affected by visual sensations and finally receives controlling impulses from the cerebral cortex Thus the linked movements of the eyes are seen to be possible only through a series of reflexes of increasing refinement The more primitive of these (the unconditioned ones) are mediated through the cerebellum and vestibular apparatus to co ordinate movements of the eyes with those of other parts of the body They are concerned particularly with the orientation of the individual in his environment The later and more delicate reflexes some of which are conditioned have their centres in the midbrain and cerebral cortex and are motivated by visual sensations and conscious impulses The conception of binocular reflexes as responsible for the movements of the eyes naturally follows and has become known in Great Britain largely through the pioneer work of Chavasse (1939) Squint is thus seen as a failure of development or perversion of these reflexes and its causes are found in defects of the sensory as well as the motor side of the reflex arc or occasionally at its centre

In the new born infant this mechanism is of course immature Even monocular fixation of an object is at first impossible because with the incompletely differentiated macula central vision is subnormal by adult standards The ocular movements tend to be aimless and badly co ordinated one with another Within the first year of life with the completion of macular development accurate fixation becomes possible The binocular movements which in the early months are intermittent and ill sustained gradually come within the first 2 years to provide constant co-ordination of the eyes in all directions of the gaze During this time the increasing fixity of the unconditioned reflexes reinforced by those set up by visual stimuli is steadily providing the neuromuscular mechanism of binocular control This mechanism however is meanwhile being subjected to the stresses and strains imposed by voluntary movements and cannot be regarded as proof

against them until the child has reached the age of 6 years or so Up to this age, therefore, defects which hinder the development of the normal binocular reflexes, even when they are not serious enough to produce a manifest squint at or shortly after birth may result in strabismus under the visual stresses of everyday life Chief among these is the convergence necessary for viewing near objects Squints appearing at this age may at first be intermittent although they tend to become constant if the obstacle to binocularity persists

PERVERSION OF THE BINOCULAR REFLEXES

Strabismus arising from perversion of the binocular reflexes has particular effects upon vision In the adult with fully developed binocular vision any pronounced deviation of the eyes leads to intolerable diplopia Occlusion of one eye or the adoption of an abnormal head posture are the only means by which he may avoid discomfort The infant on the other hand unconsciously seeks comfort by perverting his immature binocular mechanism so that the image seen in the squinting eye already less clear because it falls on a part of the retina less sensitive than the similarly stimulated macula of the fixing eye, ceases to compete with that of the good eye This he does by 'suppressing the image of the squinting eye a habit which if prolonged, leads to permanent amblyopia Alternatively he may develop abnormal retinal correspondence'— a false macula —at the site of retinal stimulation in the squinting eye In either case the cost in terms of visual acuity is great and the malposition of the eye is confirmed

The recognition of strabismus therefore whilst it involves the type and degree of the deviation is primarily concerned to determine the causative obstacle to the development of normal binocular reflexes Such obstacles may be sensory, motor or central and treatment must be directed to their early removal if the cure of the squint is to be complete

OBSTACLES TO BINOCULARITY

Sensory obstacles are those which hinder the normal appreciation of clear vision in the cerebral cortex Conditions such as unilateral ptosis, corneal ulceration or opacity congenital cataract, macular disease or optic atrophy present gross obstacles Refractive errors on the other hand may be equally obstructive by producing a blurred retinal image Motor obstacles operate by impeding the movement of the eyes so that combination of the two retinal images is hindered Paralysis of extraocular muscles—for example of the external rectus in convergent strabismus—is an obvious source of such a defect but the common attribution of limited ocular abduction to birth trauma is not borne out in obstetric practice The observations of Scobee (1948) and of Danis (1948) suggested that this defect is commonly due to congenital malformation of the muscles themselves rather than paralysis More rarely adhesions of the eye to the orbital tissues or walls from cellulitis or haemorrhage or malformations of the bony orbit are responsible for the defective movement

DIAGNOSIS

The management of a case of strabismus rests first, therefore upon recognition of the squint, estimation of its magnitude and permanence and determination of the binocular obstacle which is responsible for its appearance Since restoration of normal reflex function is the aim of treatment it is clearly important that ocular examination be undertaken when the first suspicion of a squint arises

External examination will discover any gross defects but since in the cornea and lens many important lesions are not readily visible to the naked eye examination of the eve under magnification possibly with the slit lamp microscope is often needed An estimate at this stage of the degree of strabismus forms a valuable guide to treatment and the detection of any limitation of movement is important in distinguishing accommodative squints from those due to paralysis or muscular abnormality Ophthalmoscopy is essential to exclude lesions of the optic nerve or retina and since the macula must be inspected this is best carried out when the pupil is dilated Such abnormalities when they are present become th primary object of treatment and that of the squint must await the outcome of this

Refraction

Refraction is needed in all cases for although uniocular errors are entirely responsible for the squint in only a proportion of cases contributory errors of refraction are found in the majority Special instances arise in the squints which result from anomalies of the convergence accommodation mechanism This is a group of mixed sensory motor causation in which hypermetropia by demanding over accommodation results in over-convergence or myopia by permitting near vision without the usual call on convergence encourages the development of divergent strabismus It is essential therefore that the active accommodation of the young child which will mask the full d gree of the refractive error be temporarily paralysed with a mydriatic (atropine or hyoscine) so that the error may be accurately estimated This measure alone has a profound effect upon many accommodative squints and in such cases lenses alone may effect a cure

Orthoptic report

A knowledge of the degree of binocular vision which the child has achieved in spite of the squint forms an invaluable guide to treatment and prognosis and an orthoptic report is most helpful at an early stage However since it usually involves instrumental examination with a certain amount of co operation from the child it must sometimes wait until he is old enough to provide this

TREATMENT

As always the earlier treatment can be begun the greater is the chance of cure In the case of strabismus this is so wh ther the cause be a simple one such as a refractive error calling only for the prescription of spectacles or a maldeveloped muscl needing surgical correction

Spectacles

Spectacles as has already been indicated form an essential part of the treatment of most squints Their effect may be simply to modify accommodative effort in which case no other treatment may be needed or they may also be the means of providing clear vision In the first case they may ultimately be discarded as the binocular reflexes become firmly grounded and the eyes cease to deviate but in the second case they will continue to be necessary to vision even when the squint is no longer apparent In either case it is important that the need be considered as soon as the suggestion of strabismus arises Young children tolerate lenses well when their visual advantages are sufficiently great and special frames are now made with which even infants may be safely fitted when this is indicated

against them until the child has reached the age of 6 years or so Up to this age, therefore, defects which hinder the development of the normal binocular reflexes, even when they are not serious enough to produce a manifest squint at or shortly after birth may result in strabismus under the visual stresses of everyday life Chief among these is the convergence necessary for viewing near objects Squints appearing at this age may at first be intermittent, although they tend to become constant if the obstacle to binocularity persists

PERVERSION OF THE BINOCULAR REFLEXES

Strabismus arising from perversion of the binocular reflexes has particular effects upon vision In the adult with fully developed binocular vision any pronounced deviation of the eyes leads to *intolerable diplopia* Occlusion of one eye or the adoption of an abnormal head posture are the only means by which he may avoid discomfort The infant on the other hand unconsciously seeks comfort by perverting his immature binocular mechanism so that the image seen in the squinting eye already less clear because it falls on a part of the retina less sensitive than the similarly stimulated macula of the fixing eye ceases to compete with that of the good eye This he does by 'suppressing' the image of the squinting eye a habit which if prolonged leads to permanent amblyopia Alternatively he may develop ' abnormal retinal correspondence' — a 'false macula '—at the site of retinal stimulation in the squinting eye In either case the cost in terms of visual acuity is great and the malposition of the eye is confirmed

The recognition of strabismus, therefore, whilst it involves the type and degree of the deviation is primarily concerned to determine the causative obstacle to the development of normal binocular reflexes Such obstacles may be sensory, motor or central and treatment must be directed to their early removal if the cure of the squint is to be complete

OBSTACLES TO BINOCULARITY

Sensory obstacles are those which hinder the normal appreciation of clear vision in the cerebral cortex Conditions such as unilateral ptosis corneal ulceration or opacity congenital cataract macular disease or optic atrophy present gross obstacles Refractive errors on the other hand may be equally obstructive *by producing a blurred retinal image* *Motor obstacles operate by impeding the* movement of the eyes, so that combination of the two retinal images is hindered Paralysis of extraocular muscles —for example of the external rectus in convergent strabismus—is an obvious source of such a defect but the common attribution of limited ocular abduction to birth trauma is not borne out in obstetric practice The observations of Scobee (1948) and of Danis (1948) suggested that this defect is commonly due to congenital malformation of the muscles themselves rather than paralysis More rarely adhesions of the eye to the orbital tissues or walls from cellulitis or haemorrhage or malformations of the bony orbit are responsible for the defective movement

DIAGNOSIS

The management of a case of strabismus rests first therefore upon recognition of the squint, estimation of its magnitude and permanence and determination of the binocular obstacle which is responsible for its appearance Since restoration of normal reflex function is the aim of treatment it is clearly important that ocular examination be undertaken when the first suspicion of a squint arises

If it is to achieve success treatment must be begun as soon as the presence of a squint is confirmed—very few squints which persist after the age of 1 year are cured spontaneously Spectacles form an important part of the early treatment of most squints and their influence is most marked in the years before reading has commenced Finally surgery although it is frequently the ultimate resort after the effects of optical and orthoptic treatment are known is sometimes called for as a primary measure and may then be undertaken as early as the first year of life

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Orthoptics

Orthoptic exercises with special apparatus by means of which separate images are presented to the two eyes and the patient is taught to combine them form an important aid in the treatment of strabismus In selected cases they provide the chief means of re educating the squinter in the control of his eye movements, but, in general they form an integral part of treatment by optical and surgical measures As has been indicated the child must be old enough to co operate with the orthoptist and when this is so they are especially valuable in stimulating binocularity pre operatively and in consolidating it post operatively

Measures other than exercises play an important part in such treatment, the most valuable of which is occlusion This has as its object the embarrassment or obstruction of the vision of the non squinting eye so that that of the squinting eye (which has become blurred through neglect) may be constantly employed and thus, through use improve It is achieved either completely by placing an adhesive patch over the fixing eye or partially by misting the spectacle lens or instilling atropine into the eye By these means suppression or amblyopia may be overcome and vision in the two eyes equalized When this has been achieved exercises may produce control of the squint but if a serious muscular abnormality exists either as a primary motor abnormality or secondarily as the result of prolonged malposition of the eyes surgery is likely to be necessary

Surgery

The first object of surgery in the treatment of strabismus is to restore the mobility of the eyes so that normal co ordination of the visual axes is possible If at this time optical and orthoptic treatment have rendered the eyes capable of binocular vision, the cure may become a functional as well as a cosmetic one In the case of squints due primarily to a defect of motility (from say paresis or congenital abnormality of a muscle) the operation is a radical one and deals with the primary motor obstacle to binocularity It must be realized however that habitual mal position of the eyes from whatever cause leads to secondary muscular changes—for example contracture of the over acting internal rectus muscle and stretching of the weakened external rectus muscle in convergent strabismus Such changes occur to a greater or lesser extent in both eyes in every case of squint When a pronounced deviation is present therefore operation on both eyes is often needed to correct what is apparently a monocular squint

The indication for surgical correction arises as soon as it is apparent that defective movement forms the principal obstacle to the assumption by the eyes of the normal position Operation will be deferred in many cases until the effect of optical and orthoptic treatment is known but where as in many squints appearing at birth the impaired movement is clearly a primary motor obstacle to binocular vision the indication for operation appears correspondingly early Prompt surgery in such cases offers the best chance of complete—functional and cosmetic—cure Such a result is more likely in cases appearing first in the early years of life but the longer the deviation has persisted the greater is the perversion of the reflex mechanism and the smaller the chance of complete cure (Lyle and Foley 1957)

Summary

In summary therefore it may be said that whilst mechanical surgical measures play an important part in the correction of strabismus treatment is essentially directed towards the restoration of normal reflex function and for this optical and orthoptic treatment are usually needed as well

but it is a valuable pointer to a deafness of middle ear origin probably caused by otosclerosis

The patient with a perceptive loss hears less well in noisy surroundings A cochlear defect renders the ear particularly sensitive to increased intensity of sound and there is a narrow gap—it may be non existent—between the level of useful amplification and that of actual aural discomfort or pain Shouting does not help him to hear it makes his ears send a distorted signal to the brain and it may even cause pain Amplification from an electrical aid may have the same effect particularly in the elderly patient

The hearing is not only reduced in perceptive deafness but is also distorted so that the word picture reaching the higher auditory centres in a mutilated and disjointed condition must be pieced together by a mental effort before the sense can be appreciated This effort may put the patient s concentration at full stretch Confronted with strangers or harassed by illness or anxiety he may find the struggle to understand too exhausting and is inclined to retreat into a state of not listening, a world of deafness

A very rough estimate can thus be made of the patient s hearing from his own reports and from his reactions to his physician s voice Further tests to assess the type of deafness can be made with a tuning fork but it is important to use the right type of fork If its frequency is too low the patient may feel rather than hear the vibrations when the base of the fork is applied to his mastoid process If the pitch is too high, the rate of decay of the vibrations is so rapid that there is no time for a deliberate test The most useful frequency is 256 cycles per second and the heavier the fork the better

The test is made by striking the fork and applying its base firmly to the mastoid process by passing the middle ear the vibrations reach the cochlea directly through the mastoid bone The state of the cochlea is indicated by the length of time during which the fork can be heard compared with the length of time it is heard on the mastoid process of a person with normal hearing Perceptive deafness is to be suspected if the patient hears it for a shorter time

If the patient can hear a vibrating fork longer by bone conduction than when the prongs are held close to the opening of the meatus this is evidence of defect in the conducting system of the middle ear the ossicles and so on (negative Rinne test)

In the first rough appraisal of a deaf person s suitability for surgery the bone conduction tests are important If bone conduction is diminished or absent one would be well advised to deter the patient from entertaining excessive hopes

If perceptive deafness has been excluded one must try to decide on the cause of the conductive deafness Otorrhoea with a perforation of the tympanic membrane is quickly evident on examination but the real difficulty lies in distinguishing between otosclerotic deafness and that due to adhesions or fluid in the middle ear In obstruction of the eustachian tube the degree of deafness varies and may be improved by inflation a valuable step in making the differential diagnosis because the deafness of otosclerosis is not appreciably improved by this means These cases of conductive deafness occurring behind an intact membrane are suitable for further investigation and possible surgery

CHAPTER 38

DEAFNESS

I THE SELECTION OF THE DEAF PATIENT FOR SURGERY

GAVIN LIVINGSTONE and PHILIP READING

GREAT progress has been made during the last 20 years in the control of otitis media and mastoiditis by the use of antibiotics and in the relief of deafness itself there have been important advances Not only are modern hearing aids infinitely superior to pre war models in size reliability and fidelity of reproduction but also new and promising surgical techniques have been and are still being evolved which hold out hope for the deafened patient Unfortunately this hope cannot always be fulfilled because the techniques are applicable only to certain types of conductive deafness Many deaf patients pathetically hoping for a surgical miracle, could be spared much disappointment if at their first interview with the general practitioner it could be explained to them that the decision to operate is reached only on the satisfactory outcome of several intensive tests and that even in the most propitious circumstances the results of surgery are still uncertain If the physician is also able to form some estimate however rough of the kind and degree of the deafness he will be able to fortify the patient against an unfavourable verdict from the aural surgeon

Surgery can offer relief of conductive deafness only perception deafness, due to disorders of the cochlea or auditory nerve is beyond its reach Even when the deafness is due to some middle ear lesion, such as otosclerosis the prognosis is much less favourable if there are also signs of partial cochlear degeneration

DISTINCTION BETWEEN CONDUCTIVE AND PERCEPTIVE DEAFNESS

How can the practitioner distinguish between perceptive and conductive deafness in the consulting room so that he may justifiably encourage his patient to seek surgical advice or forewarn him against probable disappointment? The only instruments available to him are his voice and a tuning fork—they will suffice

The patient suffering from conductive deafness never has a total hearing loss He can be made to hear if the intensity of sound reaching his ear is increased either by a hearing aid or by raising the voice On the other hand perceptive deafness may be so extreme that the patient cannot hear the loudest shout

The sufferer from conductive deafness may notice that he hears speech well against a background of noise in a factory or train for example because people who possess normal hearing unconsciously raise their voices to a level audible to themselves over any surrounding noise and the deaf person benefits from the raised voice This phenomenon known as paracusis is not invariably present

CHRONIC OTORRHOEA

It is difficult to separate the different middle ear infections which cause chronic otorrhoea but they fall mainly into two types, mucoid otitis media and chronic suppurative otitis media

Mucoid otitis media

Low grade recurrent infection in the postnasal space and eustachian tube may cause an intermittent mucoid discharge through a perforation in the antero-inferior quadrant of the drum This discharge may dry up completely only to return with further infection from the nose or after bathing or perhaps after syringing and both bathing and syringing should be avoided in the presence of a perforation The hearing loss with such a condition is slight though the larger the perforation the worse the hearing The ossicular chain usually remains intact and sometimes the hearing improves when the ear is discharging In these cases the discharge may be profuse but its smell is not offensive as it is in chronic attic or mastoid cases

This mucoid type of otitis media usually heals without surgery but if the discharge persists and no treatment is given, otitis externa may ensue and produce an unpleasant condition of the skin of the meatus while later a secondary infection of the mastoid may take place The discharge can usually be cleared up by getting rid of the infection of the postnasal space which may be caused by adenoids or infected sinuses or teeth The local treatment consists of dry cleaning and in keeping the outer ear clean Drops in the ear may help Chloramphenicol 10 per cent in propylene glycol used either with a saturated wick of gauze as advocated by Lewis Gray and Hewlett (1952) or as drops 4 hourly These should be used with care as some patients are sensitive to chloramphenicol and may develop otitis externa The drops should not be used for more than 10 days at a time

Although the infection may disappear and the ear become dry there is still a risk as long as there is a perforation present However a skin graft can be put over the perforation and with recent improvements in technique there is an 80 per cent chance that it will close completely Usually the hearing is improved but the method will be discussed later with other tympanoplastic procedures The advantages of a healed and dry ear need not be stressed and patients are delighted to be able to forget the dangers which were previously associated with bathing or letting water into the ears

Chronic suppurative otitis media

Chronic suppurative otitis media may be further subdivided into cases where the infection arises from the mastoid aditus and those where it arises in the attic region In both types with daily cleaning many ears become dry but it is usually only a matter of weeks before the discharge returns (Johnson 1948) Chronic middle ear infection is more likely to occur in patients whose mastoid bones are dense and acellular Granulations and cholesteatoma the typical accompaniments of chronic otitis media cause gradual but relentless destruction of the bony walls of the middle ear and also of the ossicles The joint between the long process of the incus and the stapes is the first area to be destroyed causing a break in the ossicular chain This catastrophe produces by itself a 30 decibel hearing loss and the decision to operate must not be postponed till this has occurred

Sometimes continuation of the infection in the mastoid is encouraged by polypi and granulations which prevent drainage Removal of the polypi is a relatively

II DEAFNESS ASSOCIATED WITH CHRONIC INFECTION

GAVIN LIVINGSTONE

PERSISTENT discharge from an ear may be caused by otitis externa or by a chronic infection of the middle ear With otitis externa the hearing should be normal and the drum, if it can be seen, should show no perforation, but when there is stenosis of the meatus it is sometimes extremely difficult to make sure that the drum is intact There are no indications for surgery in the condition of otitis externa but it must be mentioned as a chronic suppurative otitis media may be the underlying cause and unless this is suspected and treated the ear will continue to discharge and deafness will ensue If a tuning fork is used to test the hearing and the air conduction is found to be better than the bone conduction no middle ear infection is present When the bone conduction is the better of the two middle ear infection should be suspected though occasionally the deafness is due to a mechanical blockage of the meatus caused by the otitis externa alone

DEAFNESS WITHOUT DISCHARGE

Chronic infection of the middle ear is usually associated with discharge and deafness Conductive deafness may be present without discharge however in three conditions—masked mastoiditis serous otitis media, and otosclerosis (*see* page 345)

Masked mastoiditis

In masked mastoiditis the deafness is due to a mastoid infection associated with inadequate treatment of acute otitis media A history may be available of antibiotic dosage which was small and too infrequent The discharge dried up and the temperature dropped but the deafness persisted This persistence of deafness is a sign that infection is still present and the indications for surgery on this type of ear depend more on the non recovery of hearing than on the recurrence of discharge In these cases the tympanic membrane appears dull and thickened and tuning fork tests confirm middle ear deafness by showing that bone conduction is better than air conduction If the deafness has not recovered after 3 weeks of adequate antibiotic treatment the mastoid should be explored It is sometimes difficult to persuade patients and even their doctors that this persistent deafness is an indication for surgery lest hearing be permanently lost

Serous otitis media

Serous otitis media is a condition in which fluid collects in the middle ear It is probably associated with mild infection of the mucosa in the mastoid and middle-ear cavity The patient complains of a feeling of woolliness in the ear with a fairly marked hearing loss A sensation of fluid in the ear is often present The appearance of the drum is opaque and sometimes a fluid level or bubble of air may be seen through the drum If the nose and throat are healthy a myringotomy should be performed and the fluid sucked out or blown down the eustachian tube sometimes as much as 7 ml may be removed After this there is usually a dramatic improvement in hearing but the procedure may have to be repeated on two or three occasions If the condition does not settle the middle ear may have to be explored and more adequate drainage established In a case of middle ear deafness of fairly short duration with an intact drum it is always worth while incising the drum to see if fluid is present

COMPLICATIONS

Fatal complications of mastoiditis and otitis media are now rare In England and Wales in 1953 there were only 332 deaths from all forms of inflammation of the ear compared with 2 366 in 1925 (Bowen Davies 1955) The incidence of complications is highest in cases where the ears have been neglected Many patients suffering from otitis media become used to the discharge and deafness and do not come up for treatment They continue with self treatment for years with little trouble and do not appreciate the dangers involved should the infection break out of the mastoid and middle ear cleft If it does so the infection may spread in any of three directions each of which leads to dangerous complications requiring in patient treatment and possible urgent surgery

When the spread is inwards the labyrinth becomes *infected* and *although* labyrinthitis is now no longer a fatal condition the cochlea will almost certainly be destroyed resulting in total deafness Bouts of vertigo with a discharging ear are a sign of impending labyrinthitis When the infection spreads backwards the facial nerve may become involved However the paralysis usually recovers with the removal of the infection The lateral sinus may become thrombosed and emboli break away causing pyaemia Rigors in patients with discharging ears should therefore be viewed with alarm When the infection extends upwards meningitis or a cerebral abscess may develop and of all brain abscesses 46 per cent are due to otological causes (Pennybacker 1950)

Such are the possible complications that a chronically discharging ear must be regarded as always dangerous

CHOICE OF OPERATION

Advances brought about by the introduction of fenestration surgery the security offered by antibiotics and the use of the operating microscope have altered and enlarged the whole field of mastoid surgery The emphasis is now on preserving function or if this is absent on reconstructing the middle ear to enable sound waves to reach the organ of *Corti*

These newer techniques should not be attempted until all disease has been dealt with This means that all cholesteatoma *matrix* granulations and the remnants of the incus and malleus must be removed and it is only after such meticulous eradication of disease that an *attempt* should be made to reconstruct the middle ear

During the last 5 years much has been learned about the way in which sound impulses stimulate the cochlea Sound waves reach the cochlea through the oval window and pass out by the round window and should the impulse reach both the oval and round windows simultaneously no stimulation takes place Hearing therefore requires that the waves reaching the two sites should be out of phase In the normal ear the tympanic membrane shields the round window while the sound waves are transmitted through the ossicular chain to the oval window

In cases where there is a large central perforation with an intact ossicular chain great hearing improvement can be obtained by placing on the perforation a small pledget of oiled cotton wool which acts as an artificial drum In this way the round window is screened as in the normal ear The principle to be followed therefore in the reconstruction of the middle ear is to allow sound waves to be conducted to the stapes and oval window while making sure that the round window is screened If this arrangement can be achieved the phase difference necessary for hearing will be produced

simple procedure, but it should always be undertaken with caution, in case they take origin from the inner wall of the middle ear when removal may allow infection to enter the labyrinth After removal of polypi or granulations the infection sometimes settles Such a result however is unusual as once the bony wall of the middle ear has become involved the condition seldom resolves without surgery Rapid recurrence of granulations is a sign of activity and is a positive indication for operation

Cases that are always difficult to decide about are those with attic perforations and cholesteatoma These cholesteatomas have an insidious onset but when they are infected there is a slight but invariably offensive discharge The hearing is not however impaired during the early stages

Cholesteatoma

Cholesteatoma is a condition in which the squamous epithelium from the outer ear grows into the middle ear and extends around the ossicles and into the mastoid antrum Desquamation occurs and a putty like mass is formed The bones become eroded and infection spreads into the surrounding structure The size of the attic perforation is no guide to the amount of disease present A tiny perforation may be all that shows when the whole of the middle ear has become disorganized The hearing in these cases is sometimes remarkably good, for the cholesteatoma itself conducts the sound waves to the stapes For patients with good hearing and cholesteatoma operation should always be performed sooner rather than later because delay in opening the middle ear inevitably results in the ossicular chain becoming broken It is important therefore to make an early decision to operate and this is especially true in the case of children

FREQUENCY OF THE DISEASE

Chronic otitis media is still a common condition especially among the less educated and in crowded and poor districts Johnson (1948) in a survey of 1,000 industrial workers in the Midlands, found 5 9 per cent with active ear disease and there was evidence of former infection in 14 6 per cent But its incidence is declining owing to improvements in treatment and also to the better care taken of children by the school medical services However the number of patients with attic infection with cholesteatoma does not seem to be diminishing

The age of a patient does not directly influence the decision to operate In children where the pathology is great and where an operation will probably increase the hearing loss it is wiser to wait until the education is completed before exploring the mastoid There is a tendency for the infection in the ear in children to become quiescent at puberty and the ear to become dry

Children with attic infections however are not included in this group and an operation is indicated before there is a hearing loss

All cases with cholesteatoma require hospital out patient supervision

ASSOCIATED DISEASES

Chronic otitis media may be due to special causes, of these tuberculosis should be remembered, though this is now rare and becoming more so as the incidence of the pulmonary disease falls

Tympanoplasty

There are many operations aimed at preserving function which are modifications of the classical mastoid operation Zöllner (1954) and Wullstein (1955) have tried to rationalize the operation and the various stages involved in the reconstruction of the middle ear cavity These operations are called tympanoplasties and there are five types

Type 1

In cases where there is a simple dry perforation with an intact ossicular chain a full thickness skin graft taken from behind the ear is used to cover the hole in the drum In order that the graft may take the superficial layer of epithelium must first be removed from the drum This operation is sometimes called a myringoplasty and is successful in 66 per cent of suitable cases (Mawson 1958) Many surgeons feel that it is safer to explore the middle ear first to make sure that no further pathology is present and to check that the ossicular chain is functioning before closing the perforation (Figs 7 and 8)

Type 2

When there is attic infection but the ossicular chain is still intact the graft is placed over the remains of the drum and ossicles after all disease has been removed

Type 3

When the ossicular chain is broken and the malleus and incus have been removed the graft is placed across the middle ear cavity and allowed to come in contact with the head of the stapes In this way a new middle ear cavity is formed Sound waves will then be transmitted directly to the stapes while the round window together with the eustachian tube will open into the new cavity This is the most usual and effective type of tympanoplasty The new middle ear resembles the ear of a bird, with the stapes acting as columella (Figs 9 and 10)

Types 4 and 5

These are more complicated operations and are required when all that remains of the ossicles is the foot plate of the stapes either mobile or fixed In these cases two separate cavities have to be formed one which will contain the round window and eustachian tube and the other which will open into the meatus and allow direct access of sound waves to the oval window or if the foot plate is fixed to the fenestra which is made to replace it (Figs 11 and 12)

CONVALESCENCE AND MANAGEMENT OF THE POST OPERATIVE PERIOD

Painful mastoid dressings entailing plugging the cavity continuously for weeks are very unusual nowadays and after a tympanoplasty little discomfort is suffered The ear is lightly packed usually with gelatine sponge which dissolves spontaneously Patients leave hospital after the first dressing and the general practitioner has usually to give no local treatment beyond re applying the bandage

The cavity may heal rapidly if the epithelium spreads over the bony walls but sometimes discharge persists In fact it is difficult to guarantee that an ear will become dry in any given time The ear which continues to discharge after a mastoid operation is a social nuisance but it is not a potentially dangerous ear as it was before operation and it will probably dry up with time and care A second operation may sometimes be required to remove granulations, but this is unusual

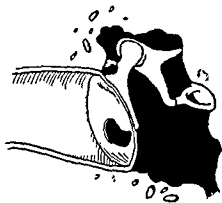


FIG 7 —Central perforation of membrane



FIG 8 —Myringoplasty

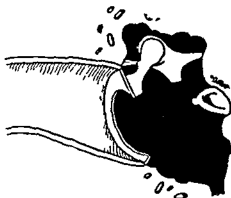


FIG 9 —Chronic suppurative otitis media Destruction of long process of incus

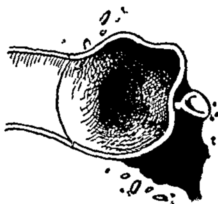


FIG 10 —Mastoidectomy and tympanoplasty (the columella operation)

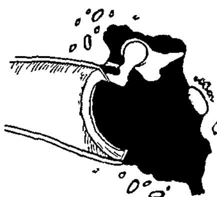


FIG 11 —Chronic suppurative otitis media Destruction of long process of incus and crura of stapes

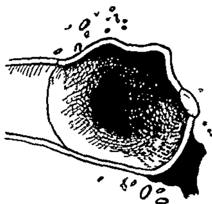


FIG 12 —Mastoidectomy and tympanoplasty Note air pocket created over round window communicating with eustachian tube

III OTOSCLEROSIS

PHILIP READING

OTOLOGISTS used to be disinclined to diagnose otosclerosis as a cause of deafness knowing as they did that it implied a prospect of relentless and progressive degeneration of hearing an outlook specially tragic because so many of those afflicted were young healthy and attractive Instead they used to cling desperately to vague diagnoses such as tubal obstruction or catarrhal deafness Since the work of Lempert (1938 1948) has shown the possibility of surgical relief however otosclerosis is more frequently diagnosed

The basic lesion is an outgrowth of spongy bone from the bony capsule of the inner ear It may occur in any part of the capsule (Guild 1944) but shows a strong predilection for the anterior margin of the oval window eventually involving the foot plate of the stapes and so limiting its movement In consequence the amplitude of vibration in the scala media of the cochlea is reduced

CLINICAL PICTURE

The onset of the deafness is insidious women may notice difficulty in hearing after the birth of a child Often there is a strong family history of similar deafness Tinnitus may accompany and occasionally precede the deafness Many patients first seek relief in the third decade of life when the defect begins to limit their efficiency at work and their happiness at home Otoscopy shows a normal tympanic membrane moving normally on inflation of the eustachian tube Occasionally a pink flush is to be seen just behind the umbo of the malleus this is the so called flamingo flush which indicates hyperaemia of the inner tympanic wall and in consequence active bone formation It is regarded by many otologists as a sign of rapidly advancing disease with a grim prognosis

SPECIAL TESTS

Tests with the tuning fork show that hearing by bone conduction is maintained longer than that by air conduction the hearing by bone conduction should last for at least as long as normal The patient is next subjected to audiometry the audiogram of a normal person shows that all frequencies between 125 and 12 000 cycles per second are heard with a minimum of amplification (Fig 13) With an otosclerotic patient a hearing loss of varying intensity may be elicited but the same signals passed through a bone transmitter will be heard at or near their normal threshold—that is a negative Rinne test and good bone conduction In this way the audiometer confirms the findings with the tuning fork (Fig 14)

The audiometric indication of cochlear degeneration which may occur later in otosclerosis is impairment of bone conduction and inability to hear the higher frequencies without further amplification—that is a falling curve (Fig 15) Speech audiography is used to test the patient s powers of discrimination and if he returns a low score of the test words and phrases used cochlear degeneration is certain and hopes of surgical relief are small (McKenzie 1952 Walsh 1953)

The operative prognosis can be illustrated by three audiograms

Case 1—This patient complained that she missed occasional words and phrases a slight source of embarrassment to her She had to be careful in company lest she should mishear a remark and make an inappropriate reply She heard well at cocktail parties and in trains at the theatre she liked to sit near the front but even there she missed the quieter speeches Her audiogram (Fig 16) showed a loss for air conducted sound of 30 decibels she heard the higher frequencies better than the

The organisms present in cavities which continue to discharge are most frequently *Proteus vulgaris* and *Pseudomonas pyocyanea* Although they are usually insensitive to the antibiotics, chloramphenicol drops often help Where the discharge continues the patient should always be referred back to the consultant who should follow it up until the cavity is satisfactory When the hearing is improved after a mastoid operation it may be unwise to operate again to obtain a dry ear Patients are usually prepared to accept some discharge as long as the hearing is good and the ear is safe This is especially true if both ears have a hearing loss and are infected

The hearing results following tympanoplasties vary with the type of operation and with the surgeon but figures show that after Types 1 2 and 3 about 30 per cent of patients have improved hearing especially for speech (Beales 1958), and that the proportion of dry ears is as high as it was with the older types of radical mastoid operation

CONSERVATIVE TREATMENT

Many patients with chronic otitis media fail to come for surgery either because of age or unwillingness The statement 'I have had a running ear for the last 20 years and I don t want to have an operation , is always difficult to answer

The management of such a patient consists in frequent cleaning of the ear and in instructing him on how to clean it himself Drops of acetone and 70 per cent spirit in equal parts may keep the ear with cholesteatoma fairly comfortable The general practitioner should always remember however that these ears are liable to cause serious trouble and need frequent inspection

SUMMARY

The following signs and symptoms associated with otitis media are indications that surgery may shortly be necessary

(1) Prolonged deafness following an acute otitis media (masked mastoiditis)
(2) Attic cholesteatoma
(3) Any sudden increase in the discharge or in the deafness
(4) Bouts of vertigo or unsteadiness
(5) Excessive granulations with bleeding
(6) Persistent headaches or vomiting
(7) Persistence of deafness or discharge in children This should always be fully investigated

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lower (climbing or scorpion tail curve) and the bone conduction was normal She might obtain spectacular results after mobilization but the deafness is not so marked that fenestration will produce a worth while improvement

Case 2—This patient s deafness was more marked she found that she could hear conversation if she was able to watch the speaker s lips Paracusis might still have been present She needed a hearing aid to enjoy the theatre and found it increasingly embarrassing to meet strangers never being sure that she would be able to hear them She often had an almost morbid fear of being thought deaf and so would not wear an aid in company though it would have given her good hearing Her audiogram (Fig 17) showed a loss by air conduction of some 30–40 decibels the upper frequencies being still well retained though her bone conduction was slightly reduced A successful fenestration would bring her air-conduction hearing up to the level of 25 decibel loss a gain which the patient would greatly appreciate or a preliminary mobilization might be tried followed in the event of failure by fenestration

Case 3—The hearing in this patient had deteriorated further She could hear nothing but the loudest and clearest speech from her family and friends Strangers she eldom met because she tended to retreat into her silent world of deafness and no longer made efforts to emerge from it into the difficult world of hearing people She complained of head noises and was becoming a moody person and increasingly difficult to live with. The audiogram (Fig 18) showed a loss for air conduction of 60–70 decibels The higher frequencies were not so well heard and the bone conduction was almost at the same level as the air curve It is not so much the level of air-conduction loss that would deter the surgeon from offering operation in her particular case as the deterioration of the bone conduction Satisfactory return of hearing after either fenestration or mobilization is unlikely

In reaching a decision whether to operate on the otosclerotic patient not only must the results of the ear examination be borne in mind but also other clinical evidence which may not be capable of so precise a statement

THE AGE OF THE PATIENT AND THE DURATION OF THE OTOSCLEROSIS

Throughout life the deafness is irregularly progressive so that in later years the picture of Case 3 above may be seen. The process of degeneration of the hearing may be rapid in one person so that a girl aged 25 years may have advanced changes while in another it is slow so that a woman aged 50 years may have relatively slight deafness On this account the age of the patient is no barrier to operation provided that the general health will allow surgery to be performed in safety Though there are a few circumstances which permit the operation in children in the very young fenestration is contraindicated because osteogenesis is very active and early spontaneous closure of the newly made window is likely, the bone of the older patient being less active there is a smaller risk of closure

THE PSYCHOLOGICAL STABILITY OF THE PATIENT

The psychological factor is of great weight in reaching a decision Both mobilization and fenestration have their drawbacks not the least being the uncertainty of relief Considerable fortitude is demanded to bear all the vicissitudes of the post operative period with equanimity and one would choose to shelter the highly apprehensive or unstable person from the ordeal On the other hand the disability of deafness may itself render the patient morose and emotionally unstable so that the psychological disability must be regarded as an encouragement to operate

One patient seen by the author was a female aged 35 years unmarried and deaf, who had on two occasions tried to take her own life At the insistence of the psychiatrist the author attempted a mobilization of the stapes it failed, and a few weeks later she again attempted suicide by swallowing a large quantity of aspirin Undaunted the psychiatrist drove the unwilling surgeon to perform a

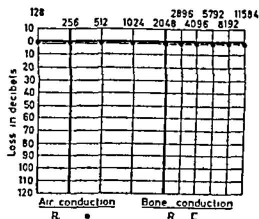


FIG 13 —Normal hearing by air conduction (note only the hearing of the right ear is recorded for clearness)

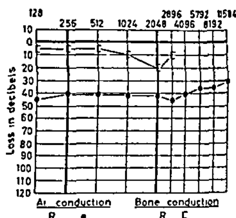


FIG 14 —Air conduction of the right ear showing a loss of 40 decibels Bone conduction is almost normal—the gap between the two curves is the air–bone gap

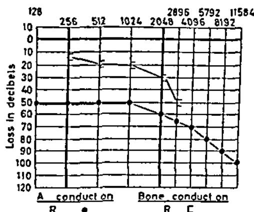


FIG 15 —The hearing for the higher frequencies has deteriorated and there is a significant reduction of bone conduction hearing

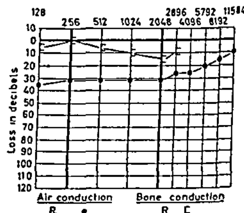


FIG 16 —A 30 decibel loss of hearing and climbing curve good bone conduction

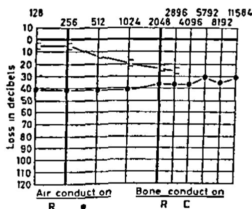


FIG 17 —A 40 decibel loss the bone conduction is falling off slightly

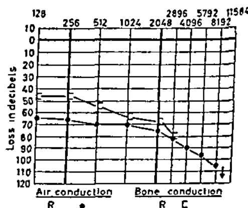


FIG 18 —Loss of 60 decibels and over for air conduction Bone conduction hearing is little better—closure of air-bone gap

plate to the margins of the oval window The force is applied however along the slender crura of the stapes and only too often they snapped through before mobilization of the foot plate was achieved Recent changes in technique consist of an attempt to break down the bony adhesion by a direct attack with a fine gouge or burr on the edges of the foot plate (Heerman 1956)

The operation may be done under either local or general anaesthesia the great advantage of the former is that the hearing may be tested by voice or audiometry at various stages of the operation so providing a guide to the surgeon Nervous people may be reassured that it is no worse than having a tooth filled under local anaesthesia

Manipulation of the stapes and foot plate is continued until the surgeon is satisfied that he has either obtained optimum mobilization and hearing or that his efforts are not going to be crowned with success The membrane is then folded back into place after aspiration of blood from the tympanum No dressing is required beyond a pledget of sterile wool in the meatal orifice In a successful mobilization the patient must be warned that the newly gained hearing may regress a few hours after the operation but that it will return in a few days A course of a broad spectrum antibiotic such as Achromycin is given for a few days as a prophylactic against infection arriving through the eustachian tube and the patient is warned not to sneeze or blow the nose for 1 week No dressing is needed perhaps at the end of 3 weeks a hard crust of blood may have to be picked out of the meatus Occasionally an otitis media may develop but it will always respond to treatment a permanent perforation of the membrane very occasionally results An annoying complication is loss of taste over the anterior two-thirds of the homolateral side of the tongue owing to cutting or bruising of the *chorda tympani* during the operation

Results

The disadvantage of the mobilization operation is that only 1 in 3 patients is permanently benefited by the original Rosen technique the newer direct approach yields a higher proportion of immediate successes but the passage of a few months sees this figure come down to approximately 40 per cent probably as a result of the greater trauma and consequent bony repair in the region of the oval window margin So far as can be foretold this 30–40 per cent of patients will enjoy permanent improvement Unfortunately there is no means before operation of distinguishing among suitable subjects those who will and those who will not improve

Fenestration

Fenestration is now a well tried operation its advantages and disadvantages are fully established and its limitations are unlikely to be overcome by further advances in surgical technique

The criterion taken of satisfactory post operative hearing is not normal hearing but the ability to hear the spoken word accurately at a distance of 10 feet and the patient can be told that 70–80 per cent of carefully selected and well operated on ears will enjoy this amount of improvement To achieve this result the patient must first have been most painstakingly selected and any departure from the ideal will lead to poorer results

The patient will have to submit to a major operation under general anaesthesia Through an endaural or postaural incision the surgeon opens the mastoid aditus

fenestration which was successful At the time of writing the patient s mental condition is greatly altered for the better she takes a pride in her appearance attends dancing lessons, and is obviously enjoying her life

THE GENERAL HEALTH OF THE PATIENT

Mobilization may be performed for any person free from mortal disease whereas fenestration demands that no incapacitating disease be present, very defective eyesight or diseases producing instability of the locomotor system are absolute bars to this operation

EXPLANATION OF THE NATURE OF THE OPERATION TO THE PATIENT

Having assessed the suitability of the ear for surgery and the patient s general health fortitude and psychological stability the first step towards operation may be taken by explaining the cause and nature of the deafness It is impressed on the patient that the treatment of otosclerotic deafness consists of a definite course of therapy, not just the performance of an operation no matter how brilliant its conception and execution The patient is persuaded to wear a hearing aid for a few weeks, this provides a valuable test of the cochlea to hear amplified sound and of the patient s determination to come to terms with her disability

Before the patient is allowed to decide on operation, the rationale of the two operations mobilization and fenestration must be explained and the relative advantages and disadvantages detailed It is a sound practice to provide a printed sheet of information about the operations which the patient is encouraged to read and to discuss with the nearest relatives so that the family is aware of all the facts In addition, the surgeon will do well to read the information through with the patient and the relatives so as to be able to explain any difficult point There should be no doubt that the patient is in full possession of all the facts before agreeing to an operation with so uncertain an outcome

Mobilization and fenestration are complementary to one another, if the former fails the latter may succeed There is a tendency to restrict fenestration to the treatment of the unsuccessful mobilization case but it is the older and better tried operation and there may be some patients who would prefer the surer method though it entails greater post operative disadvantages

SURGICAL TECHNIQUES

It may be helpful to consider briefly the two actual surgical techniques and their benefits and disabilities

Mobilization of the stapes

Mobilization consists of a direct attack upon the stapes Working through a speculum in the meatus the skin of the posterior meatal wall is incised close to the edge of the tympanic membrane and parallel to it The skin is elevated off the bony wall of the meatus and the posterior part of the tympanic membrane is lifted up with it and rolled forwards thus opening the tympanum and bringing into view the incudo stapedial joint Using either a loupe or an operating micro scope the surgeon drills or scrapes flakes of bone from the overhanging posterior bony wall of the meatus until he succeeds in bringing the entire foot plate of the stapes into view

The original technique of Rosen (1955) was to apply pressure to the neck of the stapes with a curved probe thus to loosen the new bone binding the foot

will enjoy an improvement after the operation but of these about 10 will have, during the first 6 months a gradual deterioration of the hearing to the pre operative level The fenestra has shut spontaneously in spite of the surgeon s efforts Some of these closed fenestrae can be re opened later and the hearing restored but there is considerable risk of damage to the membranous labyrinth during the procedure The tendency of the fenestra to shut grows less after the first year so that the results at the end of the third post-operative year can reasonably be taken as being permanent

Fenestration may be successfully employed when mobilization has failed and *there are recent reports of this order being reversed. After spontaneous closure* of a fenestra rather than re open it the surgeon has mobilized the stapes causing the tympanic membrane to adhere to the stapes (columellar hearing) A few reports are encouraging but it is still too early to assess the value of this new procedure

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and attic and exposes the prominence of the horizontal semicircular canal of the labyrinth on the medial wall of the attic by removing the incus and the head of the malleus A skin flap is raised from the meatal wall, hinged on the pars flaccida, under magnification a hole is drilled into the bony canal so as to open the peri lymphatic space and expose the membranous canal the window, or *fenestra* is then covered by the apposition of the skin flap which has been carefully thinned and cleansed of bony spicules Great skill and care are needed to fashion a fenestra which will not close spontaneously by the outgrowth of fresh bone from its margins

The first dressing and removal of packs from the cavity is done in 10 days often under general anaesthesia The patient should expect to stay in hospital for about 2 weeks, compared with the 3 days needed for a mobilization After leaving hospital it will be necessary to attend at intervals for several weeks or months for cleaning of the ear cavity Indeed one of the great disadvantages of fenestration is subsequent aural discharge Though most of the cavities heal in 2–3 months about 10 per cent continue to suppurate indefinitely no matter how carefully they are treated Even a well healed and dry fenestration cavity requires regular after care by an otologist at intervals of a few months If the patient lives in a remote or backward country this may prove a great difficulty

Complications

Post operative vertigo is always present its degree and persistence depend largely upon the damage the labyrinth has suffered at operation and on the course of subsequent serous labyrinthitis Usually it diminishes and has ceased to be troublesome in a fortnight Some patients however never lose the vertigo com pletely and a few often those whose hearing has not improved adequately after operation complain bitterly of persistent giddiness The patient should be cau tioned that it may be dangerous to dive or swim in deep or rough water The sudden entry of cold water into the ear may produce disabling vertigo and drown ing might result Furthermore aural discharge may recur after swimming

The risk of temporary facial paralysis in this operation and in mobilization is about 1 per cent the weakness is rarely complete and disappears within a few weeks Very rarely indeed has a permanent paralysis resulted

Results

The eventual hearing level after a mobilization may be normal because the normal mechanism of hearing is restored, fenestration on the other hand replaces this machinery by the clumsy and relatively inefficient method of passing the sound wave into the cochlea through a window covered with a skin flap Improved hearing may result from fenestration normal hearing seldom or never

It has been mentioned already that 70–80 per cent of carefully selected and surgi cally treated patients may be expected to secure a real and permanent benefit after fenestration An analysis of the method of arriving at this figure throws light on some more complications of the operation

If it is assumed that 100 equally suitable patients are operated upon with uniform maximum skill 1 or 2 of that 100 will lose most or all of their hearing in the operated ear as a result of traumatic labyrinthitis 10–15 per cent will find their hearing is made neither better nor worse, and in these the operation has failed because pre operative selection has been faulty The remaining 80–90 per cent

will enjoy an improvement after the operation but of these about 10 will have during the first 6 months a gradual deterioration of the hearing to the pre operative level The fenestra has shut spontaneously in spite of the surgeon s efforts Some of these closed fenestrae can be re opened later and the hearing restored but there is considerable risk of damage to the membranous labyrinth during the procedure The tendency of the fenestra to shut grows less after the first year, so that the results at the end of the third post operative year can reasonably be taken as being permanent

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CHAPTER 39

VERTIGO

JOSEPHINE COLLIER

VERTIGO is a symptom in which the patient has the sensation that the external world is moving around him, or that he himself is moving in his environment The sensation is more than a feeling of unsteadiness or a sensation of movement inside the head It is a symptom not to be confused with ataxia though understandably there will be an unsteadiness of gait when a patient suffering from vertigo attempts to walk Generally an attack of vertigo is sudden and commonly recurs for periods of relatively short duration—minutes or hours—with nausea and vomiting

The first sudden attack of vertigo often accompanied by tinnitus and deafness, with pallor, sweating nausea and vomiting may appear catastrophic causing alarm and apprehension to the patient and his family as well as bewilderment to his doctor Emergency management of the attack includes a brief examination of the ears for evidence of suppuration or herpetic vesicles and for deafness When the attack is severe the patient is usually found lying curled up on his sound side, loath to open his eyes If he can be persuaded to open them nystagmus will be seen, increasing as he looks towards the affected ear As long as the patient is in the acute stage there should be no attempt to move him indeed he should be left to adjust himself to a position that gives him least discomfort Misguided efforts to get the patient upstairs and into his own bed cause extreme distress Whilst the patient is still vomiting an intramuscular injection of sodium phenobarbitone (3 gr) should be given and later phenobarbitone by mouth or one of the sea sickness remedies such as Avomine which may have to be prescribed for several weeks

DIAGNOSIS

When the acute attack has subsided the next step is to subject the patient to a complete otological and neurological examination so that a diagnosis, or at least the anatomical location of the lesion may be established

The site of the lesion in most cases of vertigo is in the labyrinth In a series of 2 500 patients in whom vertigo was a prominent symptom Cawthorne (1957) found that the lesion was in the labyrinth or in the peripheral vestibular neurones in 85 per cent and in the central nervous system in 8 per cent

The management of vertigo has to be considered in the context of the complete range of causes of giddiness as in the table on the following page

Taking a sufferer for investigation in a quiescent interval first an accurate history must be pursued and set out with precision That will give indication of undoubted vertigo and of related symptoms—deafness and tinnitus possibly increasing with the attack Does the history reveal that vertigo is brought on only by some particular movement or position of the head? With such findings

in hand a clinical examination otological and neurological follows Further the following special investigations are made

(1) Hearing tests tuning forks and audiogram to establish the nature of the deafness—conductive or perceptive Accurate diagnosis is facilitated by means of the loudness recruitment test This requires special audiometric apparatus The test distinguishes between types of perceptive deafness Positive recruitment is invariably present and complete in established Menière s disease but not in perceptive deafness due to disease of the auditory nerve fibres

(2) Differential caloric tests for the state of activity of the vestibular apparatus of both sides

(3) Positional tests

(4) Radiography of internal auditory meatus when an auditory fibroma is suspected

(5) Wassermann and Kahn tests

(6) Examination of cerebrospinal fluid especially when an auditory fibroma is suspected

TABLE
CAUSES OF GIDDINESS

Peripheral		*Central*	
End organ in labyrinth	*Vestibular nerve*	*Nuclei in brain stem*	*Cerebral posterior temporal lobe cortex*
Direct spread of infection from middle ear	Auditory fibroma	Vascular lesions (thrombosis of posterior inferior cerebellar artery) basilar artery insufficiency	Arteriosclerosis
Ménière s disease	Vestibular neuronitis—sporadic and epidemic	Disseminated sclerosis	Tumours
Injury (*a*) Fractures of the petrous bone (*b*) Positional nystagmus	Herpes zoster	Streptomycin	Epilepsy
Vascular accidents		Tumours	

INFECTION OF THE LABYRINTH

Clinical examination of the ear may reveal evidence of chronic suppurative otitis media possibly with signs of cholesteatoma or an attic perforation Such a destructive lesion of the middle ear may have led to erosion of the bony wall of the lateral semi circular canal when the patient will suffer from recurrent attacks of vertigo sometimes brought on by pressure on the external ear—the fistula sign Once the labyrinth is invaded all the features of acute labyrinthine failure will be present these being overwhelming giddiness continuous vomiting and severe nystagmus

If there is no further spread of the infection to the meninges (antibiotics and soluble sulphonamides should of course be prescribed) gradual recovery takes place and giddiness vomiting and nystagmus cease The labyrinth of the other side now compensates and the patient recovers normal balance and gait Such a destructive lesion leaves what is called a dead labyrinth there is no response to caloric tests and as the cochlea has been destroyed the patient will have no

hearing A patient with a unilateral 'dead' labyrinth will have no further attack of vertigo

This clinical picture is important because operation is necessary when there is evidence of a fistula in the labyrinth in order to prevent extension of the suppuration and thus to render the ear safe The picture also provides guidance in recognizing the presence of a 'dead' labyrinth (by caloric and hearing tests) when operation for chronic suppurative otitis media is contemplated and the need for antibiotic and sulphonamide therapy

BENIGN POSITIONAL NYSTAGMUS

Movements of the head aggravate the disequilibrium in every form of organic vestibular disease but there is one group to be distinguished from Menière's disease where the vertigo with accompanying nystagmus occurs only when induced *by a change in position of the head The critical position is generally backwards* and to one side The symptoms come on only after a short latent period as a test can show, and last usually for a minute or so In many patients there is a history of head injury or previous ear infection The caloric tests are normal Dix and *Hallpike (1952) believe that a lesion of the otolith organ on the side placed* undermost in the test position is responsible The condition is essentially benign and the attacks cease after a time Reassurance sedatives and advice to avoid the critical position are generally all that is necessary

Another form of positional nystagmus is associated with arteriosclerosis It has been suggested that spondylosis of the cervical spine may distort the vertebral artery during the critical movement and give rise to basilar artery insufficiency Recognition of this possibility and appropriate medical treatment are required

VESTIBULAR NEURONITIS

Confusion with Ménière's disease sometimes occurs when there is acute vestibular failure on one side that does not involve the cochlea that is when a sudden attack of vertigo is not accompanied by deafness or tinnitus There may be only a single attack Sometimes disequilibrium persists for a time or attacks may recur The pathology is not entirely clear but the absence of deafness and tinnitus suggests that the lesion is central to the labyrinth in the vestibular nerve therefore, or in its nuclei This is based on the fact that destructive lesions of the inner ear involve both cochlea and vestibule Dix and Hallpike (1952) have therefore been led to give the term vestibular neuronitis to those cases of acute vertigo where the caloric responses are reduced and there is no deafness A toxic or infective cause may be responsible, as in the vertigo of herpes zoster Epidemic vertigo when there is no alteration in hearing is probably of this nature

The selective vulnerability of the vestibular nuclei in the brain stem to streptomycin is evidence of the susceptibility of the nerve to circulating toxins

Diagnosis reassurance and sedatives are the fundamentals of management of this form of vertigo Occasionally restoration of balance and confidence are delayed, special head and balancing exercises are then required (Cooksey 1946)

MENIERE'S DISEASE

Management of vertigo

The main debate for the purposes of this chapter concerns the role which surgery should have in the management of vertigo in Ménière's disease that is when vertigo is produced by recurrent attacks of acute labyrinthine failure brought

about by dilatation of the endolymphatic spaces (endolymphatic hydrops) A precise diagnosis of this condition should be sought though this is not always easy in the early stages The investigations outlined above aim at differentiating Ménière s disease as defined from vertigo of the positional nystagmus group and from diseases of the vestibular neurone These conditions have often been con fused with endolymphatic hydrops they were formerly grouped together under the name Ménière s syndrome, a term to be discarded now that the morbid anatomy of Menière s disease has been shown to involve both the cochlear and vestibular components of the labyrinth.

There is thus in Ménière s disease the cla sical combination of symptoms—paroxysmal attacks of vertigo perceptive deafness and tinnitus The deafness may fluctuate but is progressive often increasing with each attack while in some patients too distortion of sound impairs still further the ability to use residual hearing

The overwhelming nature of the attacks and the persisting apprehension of further attacks lead frequently to an emotional overlay which may at times dom inate the clinical picture The state of anxiety in a patient suffering from recurrent attacks of vertigo may however have an aetiological significance when possibly, emotional stress may act as a trigger mechanism by producing autonomic im balance On both counts the psychological aspects should be seriously considered in every patient either as cause or as result

A confid nt explanation of the anatomical basis of the symptoms is an important element in treatment Attentive listening to the history going on to a thorough clinical examination and relevant investigations all serve to satisfy the patient that his symptoms are taken seriously The writer can recall a patient with Menière s disease—an emotionally stable nurse who fearing an intracranial tumour as the cause of her vertigo had finally to be convinced by skull radiographs and lumbar puncture Only by reassurance appropriate to each patient can treatment have a chance to be effective

Medical treatment

Ass ssment of the value of conservative treatm nt is difficult owing to the natural history of the disease Attacks of vertigo occur in groups during the active phase of possibly weeks or months followed by a period of complete freedom These natural remis ions are variable in duration and may last many years This feature calls for caution in making a claim that any particular treat ment has been successful

Treatment should rightly be related to its effect on the three cardinal symptoms At the same time from a practical point of view it is the severity and frequency of the vertigo that demands relief Deafness is seldom improved by any medical treatment. The same can be said of tinnitus but with restoration of confidence as the vertigo lessens or ceases the patient is often less troubled by this symptom

The management of the acute attack of vertigo has been discussed earlier During the phase of activity if nausea persists between attacks the sea sickness remedies such as promethazine (Phenergan or Avomine) or dimenhydrinate (Dramamine) should be given rather than phenobarbitone Nicotinic acid and histamine alone or in combination are cons dered the drugs most effective in reducing the attacks Nicotinic acid is particularly useful in patients who get warning of impending attacks If they can then go to bed and take nicotinic acid the attack may abort or have diminished severity

An antiretentional diet reducing the intake of salt and fluid is recommended on the theory that the attacks are related to an increase in endolymphatic pressure from altered water metabolism A combination of different lines of treatment—sedative drugs to relieve anxiety vasodilators to control vascular changes in the labyrinth and a diet restricted in salt and fluid—is generally more successful in reducing attacks than trial of one after another Williams (1955) has shown that the symptoms of Ménière s disease can be alleviated by these means in about 75 per cent of patients The patient should be encouraged to attend regularly and the treatment should be pursued with confidence

Surgical treatment

Indications

Surgeons have advised operative treatment in between 6 and 30 per cent of patients with Menière s disease The latter figure is probably too high but may be related to selection of intractable cases collected at special hospitals The operations recommended include destruction of the labyrinth section of the vestibular nerve, cervical sympathectomy and selective destruction of the vestibular component with preservation of the cochlea by ultrasonic waves

When discussing operation it is necessary to bear in mind that the disease is confined to the inner ear and that it carries no danger to life The patient too should be made to understand clearly what the particular operation can do for each of the three symptoms and also what the sequelae may be No operation should be considered until there has been a determined and prolonged course of medical treatment combined with efforts to understand and modify the psycho genic factors that may underlie the autonomic imbalance

Only when management on these lines has failed to diminish the severity of the attacks as well as their frequency should the question of operation be raised A reassessment of the patient s disabilities and his attitude to them should be made and the audiogram and caloric tests repeated

If the attacks of vertigo are so disabling that he cannot carry on his employment or lead a normal social existence the operation must be one that is designed to abolish the vertigo Only by destroying the labyrinth can this be achieved

Labyrinthectomy

Destruction of the end organ of the eighth nerve within the labyrinth involves the cochlear as well as the vestibular component and is therefore followed by total unilateral deafness The patient should understand this fact The hearing has, however in most cases already been much impaired and sometimes distorted so that when the disease is unilateral he is little the worse by losing the remnant Tinnitus is generally unaffected

The patient with bilateral disease presents a greater problem Even though the disease may be more advanced on one side the probability that deafness will progress on the other side has led otologists to seek for conservative methods of operation, that is operations designed to preserve the hearing while destroying the vertigo producing elements of the vestibule

The type of labyrinth destruction usually employed in Great Britain involves opening the external semi circular canal and either avulsing the membranous canal or injecting alcohol The patient should be warned that he will suffer from an attack of giddiness in the immediate post operative period but with the other ear compensating the attack will soon cease and he can then expect to be free

from further attacks with loss of hearing however on the affected side A tran sient facial paralysis has been known to follow alcohol injection Otherwise labyrinthectomy should be free from complications

It must be remembered however that the operation does not deal with the still undiscovered cause of Menière s disease and not all the emotional manifesta tions are resolved with the relief from vertigo

CONTRAINDICATIONS —Apart from the special problem of bilateral disease it must be emphasized that before advising operation there should be sure evidence that the labyrinth on the affected side is still active Nothing is gained by destroy ing a labyrinth already dead where the patient s symptoms are due to the still uncompensated activity of the opposite side Patients in this state require not operation but rehabilitation exercises

Section of the vestibular nerve

Section of the vestibular part of the eighth nerve with preservation of the cochlear division is sometimes recommended for patients with good hearing A major intra cranial operation in the region of the cerebellopontine angle carries a definite risk to life and should be advised in unilateral cases only when there is very good hearing on the affected side when severe deafness from another cause is present in the unaffected ear or in bilateral cases when both sides are actively affected but these are situations seldom encountered Tinnitus is likely to persist after operation the hearing is generally but not always unaffected The operation does nothing to arrest the progress of the disease in the cochlea and there may still therefore be progressive deafness

Cervical sympathectomy

Cervical sympathectomy is recommended on the hypothesis that the accumulation of endolymphatic fluid constituting Meniere s disease is caused by vasoconstriction of the labyrinth vessels which will be relieved by cutting off the sympathetic supply The theory is not accepted by all workers in this field There is no certain evidence that vasospasm does occur in Meniere s disease except the observation that blocking of the stellate ganglion temporarily by procaine injec tions has in a few cases stopped an acute attack of vertigo Repeated injections however have not been found to influence the course of established disease

The patients considered suitable for sympathectomy are those with unilateral disease and with useful hearing in the affected ear or those with deafness in the opposite side from some other cause It has also been advised for patients with bilateral disease

Surgeons performing this operation report amelioration of the condition with diminution of the attacks of vertigo occasionally lessening of tinnitus and in a few cases slight improvement of hearing with slowing up of the rate of increase in deafness (Lewis 1956 Harrison 1956)

Assessment of the value of conservative operations suffers from the same fallacies as the assessment of medical treatment that is the possibility of long spontaneous remissions as well as characteristic and common fluctuations in hearing There is as yet insufficient evidence that the operation has a favourable effect on either hearing or tinnitus The claim of conservation of hearing with improvement of vertigo is therefore only sustained with difficulty The operation is also subject to the criticisms that are common to all sympathectomies In addition the ptosis of Horner s syndrome which follows interference with the first dorsal ganglion is a trial to some patients

Ultrasonic destruction of the labyrinth -

The application of ultra sound waves to the vestibule by a technique that avoids injuring the cochlea has been developed in one or two otological centres with the object of destroying the vestibule while preserving the hearing Disappearance of vertigo can be expected The effect on hearing and the tinnitus is less certain There is a risk of facial paralysis but this is reported as transitory

Further experimental work on animals is necessary before any confident claims can be made for this method It has the theoretical advantage of being radical in its application to the vertigo producing component of the labyrinth and con servative of the cochlea

Streptomycin destruction of the labyrinth

The well known selective toxic effect of streptomycin on the vestibule has been utilized in patients with bilateral Meniere s disease This is not discussed as medical treatment because the object is to destroy vestibular function while pre serving the remaining hearing Care must be exercised in excluding renal disease to avoid toxic complications Control by frequent audiometric and caloric tests is imperative but even then there is danger of damage to the vestibulocerebellar connexions and the risk of permanent ataxia This method should never be recom mended in the elderly in whom central compensation to the lost vestibular function is likely to be incomplete

Summary

Management of vertigo in Meniere s disease is primarily medical—to be pursued in each individual case with study and understanding of the patient together with an appreciation of the natural history of the disease

Surgery has a place only when medical treatment fails to control the severity and frequency of the attacks so that the patient is unable to carry on his employ ment or support his social existence The operations most certain to abolish the vertigo are those which destroy vestibular function that is labyrinthectomy and section of the vestibular division of the eighth nerve with preservation of the cochlear division However those patients with incapacitating and uncontrollable vertigo seldom have useful hearing worth preserving Labyrinthectomy is without notable risk or complications and for this reason is to be preferred to a serious intracranial operation

Cervical sympathectomy is still under trial The operation does no more than alleviate the vertigo without necessarily preserving the hearing Further attacks are possible so long as any function remains in the labyrinth

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TONSILS AND ADENOIDS

JOSEPHINE COLLIER

INTRODUCTION

THE ROLE of surgery in the management of tonsils and adenoids should be discussed in the light of the known physiology and pathology of the lymphoepithelial system —a tissue whose function is still however imperfectly understood The question of operation is one which seems to arouse much emotion and it should be noted that the strong advocates for operating are not always ear nose and throat surgeons

The tonsils and adenoids form only a part of the subepithelial lymphatic system surrounding the upper opening of the air and food passages The situation of this collection and the fact that it is prominent in the early years of life suggests that it may have some part in defence against pathogenic micro organisms entering the respiratory or alimentary tracts After removal of tonsils and adenoids the patient still has sufficient similar tissue in the lingual tonsils at the base of the tongue and in the vertical lateral bands behind the posterior pillar of the fauces This tissue will if necessary hypertrophy on exposure to infection The anatomy of the tonsil differs from the rest of this subepithelial lymphatic tissue in the presence of crypts whose lining of stratified epithelium may become broken in places

Normal desquamation and the collection of mucus from the ducts of glands which open into the crypts may lead to the formation of small white plugs These are sometimes seen at the mouths of the crypts or can be expressed from them They are not necessarily evidence of chronic infection though occasionally the plugs become foul and cause an offensive taste or smell When this occurs the tonsils should be removed Sometimes creamy offensive pultaceous material can be expressed from the supratonsillar fossa the large crypt at the upper pole of the tonsil now more accurately called the intratonsillar fossa

The part played by adenoviruses in disorders of tonsils and adenoids is still obscure We know that these organisms are responsible for various acute febrile illnesses occurring in children and young adults both sporadically and in epidemics For the purposes of this discussion we must draw attention to the fact that adenoviruses have been found in tonsils and in adenoids in almost every specimen examined Antibodies to these adenoviruses are present in the blood of nearly all adults while at the same time there is adenovirus in the pharyngeal lymphatic tissue in a latent state This situation resembles that found in herpes simplex Much work on the natural history of adenovirus is required before we can understand the practical importance of these latent viruses and their relationship to the recurrent upper respiratory infections which make up the clinical picture of the catarrhal child and the influence of these viruses in causing hypertrophy of the pharyngeal lymphatic tissue

Many of the difficulties which arise in discussions on the operative treatment for tonsils and adenoids are due to failure to recognize that tonsils and adenoids

should be considered separately since the pathological conditions produced by each are generally quite distinct Adenoids are a problem of childhood recurrent tonsil infection concerns both children and adults

ADENOIDS

Indications for removal

Removal of adenoids is indicated when nasal obstruction is due to the mass in the nasopharynx blocking the posterior nasal airway or the openings of the eustachian tubes It is necessary to establish that the site of the obstruction is in the nasopharynx Anterior rhinoscopy will exclude allergic or vasomotor rhinitis When either is present such a condition should be treated before advising operation on the adenoids An open mouth is not necessarily a sign of nasal obstruction nor indeed of mouth breathing A cold metal spatula held above the open mouth in front of the nose will show by condensation of the breath whether or not the nasal airway is adequate We find that many children with lips apart are not mouth breathers since the contact of the tongue posteriorly with the soft palate forms an efficient posterior oral seal This can be proved radiologically

The constantly open mouth is often an orthodontic problem rather than a rhinological one, it is generally due to an inherited malformation of the jaws—a developmental deformity with incisor teeth prominent and a high arched palate This is often associated with a short upper lip which cannot easily remain in contact with the lower lip because there is a discrepancy in the anterior posterior relationship of the jaws and teeth It is now well recognized that the deformities of the jaw and palate that constitute the adenoid facies are not produced by adenoids nor by mouth breathing but are innate in the child Ballard (1958) who with Gwynne Evans (1958) has done much to clarify our views on this problem believes that the facies is probably an ectomorphic characteristic In children with adenoid facies and in true mouth breathers, if nasal obstruction is also present it should be treated If there is no obstruction the patient should be referred to an orthodontic surgeon who will carry out dental treatment at the appropriate age Some recommend that children with the lips apart at rest who have no nasal obstruction should do lip exercises to encourage better lip posture and that when true mouth breathing is due to inherited incompetence of both the anterior and posterior oral seals a mouth screen should be worn at night Ballard and Gwynne Evans however have found that this attempt at re-education is unnecessary and that efforts to change innate characteristics of posture and behaviour of the oropharyngeal musculature are useless and frustrating to child and parents When orthodontic treatment is necessary it should be undertaken around the age of 10–11 years

The complications produced in children by nasal obstruction due to adenoids are, in general more serious than the disabilities associated with recurrent tonsillitis

When the openings of the eustachian tubes in the nasopharynx are obstructed by adenoids the air in the tubes and in the middle ear is absorbed and the tympanic membrane becomes retracted These patients may suffer from intermittent earache that does not necessarily progress to otitis media When the obstruction is persistent the retracted membrane may become immobile and there is danger of permanent middle ear deafness unless the obstruction is removed

In other circumstances eustachian obstruction from adenoids leads to recurrent attacks of otitis media Although the attacks usually subside with antibiotic

treatment repeated otitis media carries the danger of fixation of the ossicles and consequent deafness

Occasionally ear discharge persists after rupture of the tympanic membrane in spite of treatment by the appropriate antibiotic Obstruction of the naso pharynx by adenoids is the commonest cause of persistent discharge in such cases Removal of the adenoids will then be followed by cessation of the discharge and healing of the tympanic membrane

Posterior nasal obstruction from adenoids interferes with the normal mucus clearance of the nose by the orderly activity of the ciliary stream The nasal secretions thus stagnate in the nose giving bilateral mucopurulent nasal discharge followed by persistent post nasal discharge Failure of proper nasal ventilation favours the development of sinusitis When this occurs removal of the adenoids is an essential part of the treatment of the sinusitis The operation under general anaesthesia should include puncture and wash out of the antra In many children a single wash out when combined with adenoidectomy clears up the sinus infection If coughing in bed at night persists in the absence of chest infection and in spite of medical treatment the presence of post nasal discharge secondary to adenoid enlargement with or without sinus infection should be considered

Persistent enlargement of multiple discrete glands in the posterior triangle of the neck is confirmatory evidence of infection of the adenoids

Diagnosis

Persisting retraction of the tympanic membranes reinforces the diagnosis of adenoids as a cause of nasal obstruction When there is any doubt a lateral soft tissue radiograph of the nasopharynx can be taken to confirm the diagnosis

Operation

The symptoms and signs outlined in this section are evidence for removal of adenoids Only when there is also a history of recurrent attacks of acute tonsillitis should the tonsils be removed The surgeon should explain to the parents how important it is not to remove organs that have given no trouble mentioning however that tonsillectomy may be necessary in the future if frequent attacks of tonsillitis occur

TONSILLITIS

Indications for tonsillectomy

Certain individuals both children and adults suffer from recurrent attacks of acute tonsillitis The frequency of the attacks has less significance than the severity and the effect they have in interrupting normal activities particularly school attendance and work

In children the parent s testimony that each attack pulls him down or he takes a long time to recover gives a measure of the severity A careful analysis of the resulting symptoms is essential The general practition r has the chief responsibility for presenting the surgeon with an accurate history He must dis criminate and not call every pyrexial sore throat acute tonsillitis That applies to the transitory sore throat that frequently heralds the onset of the common cold and the general enlargement of the tonsils that occurs during colds or when other members of the family or the community are suffering from upper respiratory infections Above all repeated colds whether of the common cold or of allergic type should not be considered an indication for tonsillectomy With these cautions

stated relief from the previous recurrent attacks of acute tonsillitis can be guaranteed by tonsillectomy and in no other way

Frequent attacks of acute tonsillitis are rare in children under the age of 5 years When they do occur and are followed by deterioration in general health the tonsils should be removed A peritonsillar abscess can nowadays be aborted in the early stage by adequate treatment with antibiotics and there may be no recurrence After two quinsies however tonsillectomy should be advised since further attacks can be expected

Persistent enlargement of the cervical lymph nodes with tenderness during attacks of tonsillitis should be treated by removal of the tonsils In tuberculosis of the cervical lymph nodes 70 per cent show tuberculous infection of the tonsils and adenoids (Browne 1956) which are presumably the portal of entry Treatment of the cervical lymph nodes (medical or surgical) should be accompanied by removal of the tonsils and adenoids with suitable prophylactic cover of two antituberculous drugs

Tonsillectomy in general diseases

The criterion for tonsillectomy in general diseases associated with infection of the throat by haemolytic streptococci—that is acute rheumatism and acute nephritis in particular—should be the same as already stated in other cases namely a history of recurrent attacks of acute tonsillitis Without a history of tonsillitis most laryngologists do not advise tonsillectomy It should be borne in mind that bacteraemia following the operation may precipitate a recrudescence of the disease (Elliott 1939) The most suitable time for the operation should be arranged in collaboration with the physician and the appropriate antibiotic cover should always be employed The object of this prophylaxis is to destroy the organisms entering the circulation therefore the first dose of the antibiotic should be given immediately before the operation

Tonsillectomy is occasionally necessary for persistent carriers of pathogenic organisms which cannot be eliminated by antibiotics for example when haemolytic streptococci persist in the pharynx of midwives and medical students The author can recall a case where *Haemophilus influenzae* could not be eliminated from the nasal discharge of a child convalescent from haemophilus meningitis until the tonsils and adenoids had been removed

A digital examination of the nasopharynx should always be made at the time of the tonsil operation in children and in adults If adenoids are present they should be removed

Examination

The physical signs in the throat are less important than the history Most authorities agree that it is difficult to assess by examination in a quiescent interval which tonsils are liable to recurrent attacks of acute tonsillitis Generalized hyperaemia of the pharynx may be present but is not diagnostic The deeper red coloration of the anterior pillars of the fauces sometimes claimed as proof of chronic infection is, in fact a normal appearance due to the underlying palatoglossus muscle

Two spatulas—one to depress the tongue and one to press on the anterior pillar—will show if the tonsil is adherent to the tonsil bed confirming the history of previous acute attacks The white plugs of inspissated mucus and desquamated stratified epithelial cells which are often found at routine examination are an

indication for operation only when associated with offensive taste or breath Occasionally a chronic quinsy follows an acute peritonsillar abscess which has had inadequate antibiotic treatment Fluid pus can be expressed from the supra tonsillar fossa from beneath a swollen oedematous anterior pillar

The size of the tonsils is of itself of no significance and should normally be disregarded Occasionally in children large tonsils or prominent tonsils lying in a shallow fossa and projecting on to the posterior pharyngeal wall are associated with feeding problems, the child being disinclined to swallow his food Decision to remove the tonsils calls for the most careful assessment of the symptoms and of the psychological background of both parent and child A careful follow up should always be made

THE CATARRHAL CHILD

There is no doubt that removal of tonsils and adenoids has been advised too readily in the past One of the reasons has been confusion about the relation of these tissues to those acute upper respiratory infections of childhood which are responsible for the syndrome now commonly known as the catarrhal child The age incidence according to Fry (1957) is 5–7 years with a fall in incidence at 7 8 years He suggests therefore that most children will lose their coughs and colds and sore throats spontaneously and naturally if we wait long enough In this he may very well be right It still remains however that the specific dis abilities due to adenoids have to be considered in the light of the analysis made above

A careful assessment of the condition which is responsible for labelling the child catarrhal is necessary in each individual case Are we dealing with repeated common colds from an unknown virus to which there is but short active immunity? Recent work on adenoviruses as a cause of febrile respiratory infection and the possible use of adenovirus vaccines give a pointer to possible progress in our treatment and prophylaxis of this type of catarrhal child In the meantime it should be recognized that removal of tonsils or adenoids is not likely to reduce the incidence of acute colds or acute bronchitis In some children however the complaint of nasal catarrh means the persistence of mucopurulent nasal discharge after each cold All rgy and emotional disturbance should be excluded or managed There remains the child in whom adenoids are interfering with nasal ventilation and the normal mucus clearance by ciliary action to the nasopharynx We cannot expect removal of th adenoids to prevent the colds but it will reduce the morbidity of each cold and the persistence of the discharge as well as the possible complica tions of eustachian obstruction suppurative otitis media and sinusitis

DANGERS OF OPERATIONS ON TONSILS AND ADENOIDS

An operation involving a general anaesthetic necessarily carries some risk The Registrar General s reports for the years 1953–1957 inclusive mention tonsil lectomy as the cause of death in 141 cases without distinction as to age This gives an averag of 28 per annum—a figure which has to be borne in mind by the surgeon advising the operation even though related to a total of over 200 000 op rations a year

With ch ldren the psychological trauma of admission to hospital and of operation should be mitigated by proper management The mother should go with the child to the ward and should undress and bath him Premedication is necessary so that induction of anaesthesia takes place without fear or distress The chief

danger of the operation—aspiration of blood into the lower respiratory tract—should be prevented by managing the position of the patient The entrance to the larynx should be maintained at a higher level than the pharynx and naso pharynx until the pharyngeal and laryngeal reflexes have returned This is most important during the journey back to bed A short period of cyanosis from aspiration of a little blood is the commonest cause of post operative bleeding when as is usual nowadays the bleeding at operation is adequately controlled Serious reactionary haemorrhage is rare but alarming For this reason the surgeon and the anaesthetist should always be available Dealing with tonsillar haemor rhage requires more judgment and skill than performing the operation Operations for tonsils and adenoids should not be performed in institutions or buildings where blood transfusion is not provided

Operations should be postponed during epidemics of poliomyelitis when the virus is widely distributed among the population because of the risk of bulbar polioencephalitis If a child who has recently had removal of tonsils and adenoids becomes exposed to infection *gamma* globulin should be obtained from the Public Health Laboratory Service

SEQUELAE

The lateral bands behind the posterior pillars and the lymphatic masses at the base of the tongue may hypertrophy after operation and sometimes the latter can be seen in the tonsil fossa This gives no grounds for criticizing the operator, but when such enlargement occurs and gives rise to symptoms sources of infection in the nose should be looked for

An occasional sequel to adenoidectomy is due to faulty curettes If these are not sharp the adenoid mass will not be sliced off the nasopharynx and several attempts may have to be made which have the effect of tearing up the mucosa so that scarring is produced Scarring of the nasopharynx interferes with the normal mucus clearance of the nasal secretions and the individual feels a post nasal discomfort which he calls catarrh It is then that a habit of hawking is formed

Inefficiency of palatal movements giving rise to ' nasal speech is an uncommon sequel to operation In an investigation carried out by Gibb (1958) 19 patients operated on by 11 different surgeons in a total of 27 734 operations were found to have nasal escape In none was there post operative scarring of the palatal pillars Nasal speech after operation may start from failure to use the soft palate—a habit induced probably by post operative pain Occasionally a congenital short soft palate allows nasal escape after the adenoids have been removed If the condition persists speech therapy is necessary

SELECTION OF CASES

A more rigid selection of cases for operation based on the indications considered here would make waiting lists more manageable Children with eustachian obstruc tion and catarrhal conductive deafness who need removal of adenoids should have the operation performed within 2 or 3 weeks of diagnosis This applies also to children with maxillary sinusitis associated with adenoids when the opera tion includes antrum puncture and wash out Otherwise the conditions for which operation is advised become chronic and then more resistant or irreversible

Similarly when adenoids are responsible for ear discharge that persists after acute suppurative otitis media in spite of appropriate antibiotics removal of the

adenoids is an essential part of the treatment of the acute suppuration and should be undertaken in reasonable time To accept long waiting lists is tacitly to acknowledge that operation has small importance However patients subject to recurrent attacks of tonsillitis can with less risk wait for admission When the waiting time for these patients exceeds a year a fresh appointment should be made before admission and their history and condition reassessed

ASSESSMENT OF VALUE OF OPERATION

Can statistical surveys such as those of Kaiser (1930) of Paton (1943) and of McCorkle and his colleagues (1955) provide an answer to the general question of the value of tonsillectomy? In the author s opinion collections of records compiled by different individuals can supply only conjectural assessment For instance the efficiency of the operation must in some inquiries be called into question when the incidence of post operative tonsillitis has to be reckoned in the assessment Trotter (1941) said The affectation of scientific exactitude in circumstances where it has no meaning is perhaps the fallacy of method to which medicine is now most exposed

In contrast to the statistical method observations of a general practitioner—precisely recorded over a given period—are likely to provide guidance that can at least throw light on the matter

From what is known of the nature of acute upper respiratory infections—always excepting true acute tonsillitis—removal of tonsils and adenoids cannot be expected to reduce their incidence On the other hand selection of cases on precise indications as discussed above will produce the looked for result

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CHAPTER 41

SWELLINGS OF THE CERVICAL LYMPH NODES

MAURICE EWING

DIAGNOSIS

BEFORE the indications for and against the surgical treatment of a swelling of the cervical lymph nodes can be discussed, it is necessary to resolve, as far as possible, the problem of diagnosis Two questions must always be answered First, is the swelling due to an enlarged lymph node? Second if it is, what is the cause of the enlargement? Sometimes the answer to each question can be given without difficulty, but not infrequently judgment is reserved until a piece of tissue can be examined microscopically

Biopsy

Biopsy can be done in a variety of ways as follows

Needle (or aspiration) biopsy

Needle biopsy enjoys the very great advantage of being a minor surgical procedure which can safely be carried out under local anaesthesia in a consulting room A standard hypodermic needle (gauge 17) will serve admirably if fitted to a syringe with a snugly fitting plunger though there are many more complicated alternatives devised to make it easier and more certain to recover an adequate tissue sample

Given a core which is big enough, a pathologist trained and experienced in the interpretation of such small fragments can usually make a confident diagnosis Only a firm positive answer can be accepted a non committal report must be set aside and should be made the excuse for a second needle biopsy or alternatively for a formal exploration

Critics of needle biopsy point out and not without some justification that errors in diagnosis are all too frequent when important decisions are based on this practice Uncritical acceptance of a negative report may lead to a cancer being overlooked They maintain that the histological diagnosis of a lymph node biopsy, even when the whole node is made available to the pathologist for section can be difficult—the limitations of judgment based on a small needle biopsy core will be correspondingly greater Despite such criticism however reliable aspiration biopsy techniques have been developed in many centres and are now being widely practised

Open operation

There should be no reluctance in resorting to open operation In most cases it can be carried out without risk but if the node is deeply situated in relation to major vessels and is approached through a limited incision embarrassing venous bleeding can be encountered This is especially the case when an attempt is being made to remove a node from the root of the neck just above the clavicle The

most posteriorly situated nodes of the upper part of the deep cervical chain are intimately associated with the spinal accessory nerve As it runs across the posterior triangle from the sternomastoid to the trapezius it lies quite close to the skin and even the experienced can cut it inadvertently while doing a node biopsy

The nodes must be handled with great care—the injury inflicted by artery or gland forceps carelessly applied can make the interpretation of the histology significantly more difficult

Many surgeons prefer to do all open cervical lymph node biopsies under general anaesthesia In the event of the swelling being something other than an enlarged node it is often convenient to proceed forthwith with its excision Exploration of a neck swelling should for this reason never be undertaken by any practitioner who is not prepared and competent to proceed with the proper surgical treatment should his pre operative diagnosis be incorrect

The biopsy of a swelling which has not been recognized to be a carotid body tumour may lead to urgent arterial bleeding for it always has a very generous blood supply from the subjacent carotid vessels

Causes of chronic cervical lymph node enlargement

There are three main causes of chronic enlargement of the cervical lymph nodes (1) metastatic cancer (2) malignant lymphoma and (3) tuberculosis

Surgery has something to offer in the control of all three

MANAGEMENT OF CERVICAL LYMPH NODE METASTASES

Surgery or radiotherapy?

It is generally believed that block dissection offers the best chance of cure of cervical lymph node metastases The conventional method of treatment of a cancer of the mouth or pharynx is by irradiation of the primary followed by a block dissection Block dissection is also the rule in the treatment of any patient who reports with enlarged nodes in the neck, the primary having been successfully treated some time previously

Although it is clear from experience that radiotherapy can in most cases be counted on to check temporarily the growth of secondaries in the neck the dosage in such a large bulk of tissue can be pushed to an effective level only at the risk of causing considerable general upset As a palliative procedure radiotherapy has much to commend it under similar circumstances surgery has seldom anything to offer

It is not reasonable to embark on a block dissection unless it seems likely that the primary tumour can be controlled either by radiotherapy or by surgery Care of the neck nodes is for this reason usually deferred until the appropriate treatment to the primary has been completed or nearly so

Surgery is contraindicated when nodes are fixed but it must be remembered that fixation is a very difficult clinical sign of which to be certain and most structures in the side of the neck can legitimately be sacrificed save only the carotid vessels the vagus nerve and the sympathetic trunk

Radiotherapy will probably be preferred when the situation of the primary suggests that the risk of bilateral metastases is a real one—for example a cancer of the base of the tongue (especially if it happens to be poorly differentiated as is so often the case)

It would also seem reasonable to rely mainly on radiotherapy when the nearest regional lymph nodes necessarily lie in the field when therapy is being directed at

the primary—as happens for example, in irradiating a carcinoma of the tonsil

Radiotherapy also has its attractions for the very old and the very frail, but it must be remembered that it has its own morbidity

The timing of the block dissection

The timing of the operation in relation to the course of radiotherapy is often a matter for debate Any inclination to postpone it too long while observing the healing of the primary, must be strenuously resisted for fear of missing forever the chance of doing the operation while there is still some prospect of cure

The "en bloc" or combined operation

There is a school of surgeons which favours excision of the primary tumour in continuity with a block dissection of the neck nodes This operation may require either a splitting of the mandible or its partial resection to facilitate exposure and resection of the cancer and closure of the resulting defect Twenty years ago such operations were carried out at great risk to the patient death often resulting from aspiration pneumonia or from a spreading infection in the fascial planes of the neck and mediastinum Improved anaesthetic techniques such as intubation with packing of the fauces, has much reduced the former risk and the free use of blood and of antibiotics has largely removed the latter

Even when the resection is an extensive one, involving, for example sacrifice of half the mandible and a large part of the floor of the mouth and of the tongue, the disfigurement and disability which results is often surprisingly small Speech and mastication need not be seriously affected although it is seldom possible subsequently to fit a denture It may be possible to minimize the deformity by the immediate use of a bone graft but this practice may make the closure of the mucosal wound in the mouth more difficult and lead to the distressing sequel of an orocutaneous fistula An alternative is to carry out a later staged plastic reconstruction The disadvantages of this line of treatment are that the patients are usually old and quite happy with the results of a primary closure Moreover one is always reluctant to undertake any reconstruction for at least a year—nothing is more distressing for a patient than to discover a metastasis just as he has come to the last step of a complicated multi stage repair

"Prophylactic" operation

Although in the management of a patient with a primary cancer anywhere on the mucous membrane of the mouth or fauces or on the skin of the head or neck it would seem reasonable and proper—from the pathological point of view—to do a block dissection of the cervical nodes forthwith in every instance this is practised in only the minority of cases

It is felt that it would serve the patients interests best to perform the prophylactic operation in the hope that thereby the secondaries might be removed at a stage when they are still so small that they have not yet caused any clinical lymph node enlargement This is after all the argument when advising a radical mastectomy for even the earliest cancer of the breast it is in fact the basic principle of cancer surgery at most sites

In cancer of the mouth however, this line of treatment is followed by the minority Nevertheless the prophylactic' operation is almost always practised when the primary is dealt with surgically and when its excision (as for example, in the resection of a cancer of the floor of the mouth) involves opening into the

tissue planes of the neck It would seem reasonable under such circumstances to go ahead with a block dissection of the neck nodes whether they are enlarged or not

The "expectant" operation

Most surgeons prefer to postpone the block dissection until metastases are clearly evident and this practice they adopt for a variety of reasons First there is always an element of uncertainty in one s ability to control the primary If it cannot be satisfactorily dealt with there seems little justification for the addition of an operation which can be expected to improve the prognosis only very slightly Secondly there is always some risk of the tumour spreading to nodes on both sides of the neck this will especially be the case when the tumour is close to the midline in the tongue or in the floor of the mouth or situated far back in the mouth or in the fauces To embark on a bilateral operation is a formidable undertaking even when there are urgent indications for it Thirdly there is still some difference of opinion concerning the likelihood of improving survival figures by operating at the outset before the nodes are palpable It must however be borne in mind that a surgeon has no right to embark on an expectant line of treatment in relation to neck nodes unless he can guarantee with reasonable certainty that he can review the patient s progress at regular and frequent intervals This requires a personal follow up conducted by the surgeon himself Only by such a careful practice will the first hint of lymph node enlargement be detected at a time when by prompt operation there is still some chance of cure If follow up cannot be ensured it is best to proceed with a prophylactic dissection

Mortality and morbidity

The operation of block dissection can be time consuming and may be accompanied by a considerable blood loss but always provided this is made good the procedure is by no means a dangerous one and patients who are old and wasted weather it well Pneumonia is no longer a dreaded post operative complication Air embolism from the unnoticed puncturing of a major vein at the root of the neck is a real enough risk but it is easily avoided if the jugular vein is divided between ligatures at the root of the neck early in the operation

Necrosis of the skin flaps can usually be avoided by their careful design and reflection Haematoma formation or infection are the bane of the convalescent period the latter leaves the tissues on the side of the neck hard and stiff and recovery of the normal resilience of the soft parts may be deferred for many months

A salivary leak from the cut surface of the lower pole of the parotid gland, which is commonly amputated seldom persists for more than a day or two

Some patients complain rather bitterly in the post operative period of neuralgic pain over the ear and the side of the head

If the phrenic nerve has been damaged there will be restricted diaphragmatic movement on that side and some risk of basal atelectasis when the hypoglossal nerve has been divided one half of the tongue becomes wasted and wrinkled and on protrusion it deviates towards the injured side

Disability

The remote results are of more consequence Loss of the sternomastoid and of the platysma when this is sacrificed leaves the neck rather scraggy and allows the lateral half of the clavicle to fall a little downwards and outwards

the primary—as happens for example in irradiating a carcinoma of the tonsil
Radiotherapy also has its attractions for the very old and the very frail, but it must be remembered that it has its own morbidity

The timing of the block dissection

The timing of the operation in relation to the course of radiotherapy is often a matter for debate Any inclination to postpone it too long, while observing the healing of the primary must be strenuously resisted for fear of missing forever the chance of doing the operation while there is still some prospect of cure

The "en bloc" or combined operation

There is a school of surgeons which favours excision of the primary tumour in continuity with a block dissection of the neck nodes This operation may require either a splitting of the mandible or its partial resection to facilitate exposure and resection of the cancer and closure of the resulting defect Twenty years ago such operations were carried out at great risk to the patient, death often resulting from aspiration pneumonia or from a spreading infection in the fascial planes of the neck and mediastinum Improved anaesthetic techniques, such as intubation with packing of the fauces has much reduced the former risk and the free use of blood and of antibiotics has largely removed the latter

Even when the resection is an extensive one involving for example sacrifice of half the mandible and a large part of the floor of the mouth and of the tongue the disfigurement and disability which results is often surprisingly small Speech and mastication need not be seriously affected although it is seldom possible subsequently to fit a denture It may be possible to minimize the deformity by the immediate use of a bone graft but this practice may make the closure of the mucosal wound in the mouth more difficult and lead to the distressing sequel of an orocutaneous fistula An alternative is to carry out a later staged plastic reconstruction The disadvantages of this line of treatment are that the patients are usually old and quite happy with the results of a primary closure Moreover, one is always reluctant to undertake any reconstruction for at least a year—nothing is more distressing for a patient than to discover a metastasis just as he has come to the last step of a complicated multi stage repair

"Prophylactic" operation

Although in the management of a patient with a primary cancer anywhere on the mucous membrane of the mouth or fauces or on the skin of the head or neck it would seem reasonable and proper—from the pathological point of view—to do a block dissection of the cervical nodes forthwith in every instance this is practised in only the minority of cases

It is felt that it would serve the patients interests best to perform the prophylactic' operation in the hope that thereby the secondaries might be removed at a stage when they are still so small that they have not yet caused any clinical lymph node enlargement This is after all the argument when advising a radical mastectomy for even the earliest cancer of the breast it is in fact the basic principle of cancer surgery at most sites

In cancer of the mouth, however this line of treatment is followed by the minority Nevertheless the prophylactic operation is almost always practised when the primary is dealt with surgically and when its excision (as for example, in the resection of a cancer of the floor of the mouth) involves opening into the

...vious clinically, there is every chance that the infection in the node will progress When the balance between the infection and the resistance of the host is even ...e enlargement of the nodes may persist unchanged when observed for over a ...ar or more

On the other hand if the infection advances areas of caseation develop in the ...ffected nodes these enlarge and become confluent and the whole node breaks ...own to form a cold abscess This in time burrows for itself an opening in the ...eep fascia to present as a subcutaneous collection commonly at the anterior ...order of the sternomastoid The skin in turn becomes fixed stretched reddened, and eventually gives way to leave a chronic discharging sinus and the likelihood of a disfiguring scar

The progressive course of the disease is often accelerated by a superadded pyogenic infection coming from the respiratory tract the teeth or the skin Such a happening may conceal the primary diagnosis and will certainly increase the chances of abscess formation

Throughout the illness the patient s general condition may never be other than satisfactory It is uncommon to find other signs of a tuberculous infection the lung fields are usually clear

In the adult and sometimes also in the elderly the first affected nodes are those in the root of the neck Progression with sinus formation commonly occurs It seems certain that the infection in such cases has come not by the tonsil but from the respiratory tract and via the mediastinum This should be regarded as a much more serious form of infection

Management

Medical

The aim of treatment is to effect a cure preferably without the need for admission to hospital and to achieve this if at all possible without abscess or sinus formation

It should always be remembered when active surgical intervention is being contemplated that healing can reasonably be expected so long as the diagnosis is established early enough and if the patient s resistance can be increased by rest an adequate diet and the appropriate treatment of any local pyogenic infection in the mouth, the teeth, or the respiratory tract For the occasional patient with diffuse enlargement of the lymph nodes in the neck and elsewhere and a high erythrocyte sedimentation rate the full sanatorium regime is probably required

Radiotherapy has in the writer s view no place whatsoever in the control of tuberculosis in the cervical lymph nodes It is a dangerous form of therapy and its use should be restricted to the control of cancer

The place of streptomycin and of other antituberculous drugs is a matter for debate The former is probably best withheld because of its toxicity and in case it should be wanted later if the infection becomes disseminated Administration of isoniazid and PAS over long periods is however quite legitimate practice

Surgical

EVACUATION OF ABSCESS —This is now the main responsibility of the surgeon Antibiotics and chemotherapy are quite ineffectual in the control of the infection at this stage Emptying of the abscess can be achieved in several ways

Incision and expression This has now become the popular method A short incision (not more than 1 cm in length) is made in the skin at a stage when it is just beginning to become fixed and reddened As soon as the abscess cavity is

This shoulder asymmetry will occasionally cause some distress to a woman, but in the male it seldom seriously affects the fit of a coat

To make the lymph node dissection complete it is necessary to sacrifice the accessory nerve *The resulting paralysis of the trapezius produces some reduction* in the range and in the power of scapular rotation The patient may experience some difficulty in bringing the arm up from the side but the strength and usefulness of the arm below shoulder level is in no way impaired A man who earns his living doing heavy manual work with a pick and shovel can still look forward to gainful employment, but a painter may find some difficulty in decorating a ceiling

A dragging pain across the top of the shoulder and up the side of the neck is a common symptom in the early weeks it is relieved by supporting the arm by a sling secured across the opposite shoulder and usually eases after a few months

Division of the cutaneous branches of the cervical plexus will leave a variable area of anaesthesia (or of hyperaesthesia) on the auricle and the adjoining areas of the scalp but this seldom gives rise to trouble for long

Loss of the internal jugular vein causes no upset but a simultaneous resection on the two sides usually results in a disturbing congestion of the face and eyes Even in a unilateral case there is often some lymphoedema of the skin on the side of the face but this is not often obvious enough to give cause for concern

The branch of the facial nerve which descends to supply the platysma is necessarily sacrificed but its loss goes unnoticed It is also difficult to avoid permanent damage to the mandibular branch of the seventh cranial nerve which innervates the depressor of the lower lip Its division leaves an asymmetry of the lip which is most evident with the mouth fully open when the mouth is at rest all that will be *noticed is a slight reduction in the amount* of mucous membrane of the lip which is presenting (in a woman this is easily concealed by the intelligent use of lipstick)

MALIGNANT LYMPHOMA

Although very occasionally the surgical excision of cervical lymph nodes seems to be of some benefit to patients with giant follicular lymphoma or with Hodgkin s disease in general these conditions are best treated by radiotherapy or chemo therapy Surgery in this condition is of help only as an aid to diagnosis

TUBERCULOUS CERVICAL LYMPHADENITIS

Natural history

The portal of entry is assumed in most instances to be the tonsils less frequently the lymphoid tissue of the nasopharynx The tonsillar node is the first and usually the most seriously affected The patient comes complaining of the appearance over a period of some weeks or even months of a swelling below and behind the angle of the jaw but careful clinical examination will usually reveal the presence of several other nodes The tonsils do not often show obvious signs of disease To begin with the nodes are discrete but later they become fixed to one another and to adjacent structures At this stage complete resolution may ensue either by spontaneous natural healing or following appropriate treatment The node enlargement will slowly subside over a period of some months leaving as its sequel only the calcification *which can be detected not infrequently in a soft tissue* radiograph of the neck in adults This is probably the pattern of the infection in the majority of children in whom the active stage of the disease is so mild as to pass unnoticed However when the nodes have become large enough to be

Mortality

There should be no operative mortality Air embolism may however surprise an unwary surgeon and urgent venous haemorrhage worry the inexperienced There is also the remote risk of precipitating blood borne tuberculous infection with miliary spread and meningitis

Morbidity

The morbidity of the operation is directly related to the surgeon s aptitude and to his wisdom in the selection of patients for operation An incision not sited in one of the skin creases will leave an unsightly and bulky scar or even a keloid An incomplete operation may leave a discharging sinus or be followed later by a relapse with the development of a new node mass or abscess Should the mandibular (marginal) branch of the facial nerve be injured the depressor of the lower lip is paralysed Weakness of this muscle leaves the patient with a disconcerting deformity of the lip which is most apparent on smiling Division of the ascending sensory branches of the cervical plexus will cause some impairment of sensation over the lobe of the ear but the sensory overlap is considerable and persisting symptoms from this cause are most infrequent

The spinal accessory and hypoglossal nerves are also at risk Damage to the former results in paralysis of the trapezius (or the sternomastoid or both) to th latter atrophy and weakness of one half of the tongue

Tonsillectomy

Some otolaryngologists make the presence of tuberculous infection in the cervical lymph nodes an absolute indication for tonsillectomy They claim that tuberculous giant cell systems can be found in the tonsils of such children in a large percentage of cases Others adopt a much more conservative attitude and advise removal only if the tonsils are much enlarged or obviously infected

Not only is the question of tonsillectomy or not hotly contested but also its timing Some prefer to postpone tonsillectomy until after an excision of the neck nodes for fear that pyogenic infection of the tonsillar bed may precipitate softening of the nodes and abscess formation

A greater number begin treatment by a routine tonsillectomy Opinion in general seems to be swinging in favour of this latter course as a preliminary to any form of treatment be it primarily medical or primarily surgical

opened there will be a flow of pus and, as pressure is applied this will be followed by the satisfying discharge of lumps of caseous material from breaking down nodes in communication with the abscess cavity Compression is repeated energetically until blood only is expressed The wound may be allowed to heal by granulation In an early case it is legitimate to suture the incision in the hope that there may be primary healing

When there is a considerable collection of pus in the subcutaneous tissue it is best to sacrifice the stretched overlying skin and to leave a defect which will close in from its margins with surprising rapidity and commonly with only the minimum of scarring

As an alternative to expression the abscess may be evacuated by blind curettage Although there would appear to be some risk in such a manoeuvre in the proximity of major vessels experience shows that they are in fact safely protected by the fibrous wall of the abscess cavity

Aspiration It is not often possible to empty the contents of a tuberculous abscess by an aspirating needle even of large bore The first puncture yields a syringe full of creamy pus but very soon the needle becomes blocked by debris and further efforts, however diligent are usually fruitless Moreover even when the needle is inserted obliquely into the abscess through intact skin—and where possible through the sternomastoid muscle—the risk of secondary infection or sinus formation or both is very real In the writer s view aspiration is of value only as a diagnostic procedure of limited usefulness although needling followed by the instillation of sodium PAS has been claimed to achieve effective healing A limited operation for the excision of an abscess can be difficult may be dangerous and if incomplete will fail to cure (but *see* below)

Excision This was formerly a very common operation in surgical centres where the disease was prevalent In the hands of the expert it was safe and in the properly selected patient it held out a very fair prospect of rapid and lasting cure Its place in the management of tuberculous lymphadenitis however, is nowadays a very small one It should be reserved for the patient in whom the nodes remain large firm and obvious after 6–9 months or more of conservative treatment The operation may again win favour as an ancillary to chemotherapy when the infection has been effectively contained in a few large nodes

The presence of an abscess does not rule out entirely the chances of a complete dissection It may be possible to resect the abscess cavity and the mass of nodes together It does however make the operation much more tedious The extent of the infection as observed at operation is always greater than is suspected clinically This makes the need for a generous incision a real one and a wise surgeon embarks on a limited resection of caseating lymph nodes with great care and some reluctance

It would seem reasonable to conduct any wide excision of tuberculous nodes under the cover of a short course of antituberculous drugs

Although most surgeons will admit that the indications for the dissection of tuberculous nodes in the neck are now few the older among them still remember the prompt and effective healing which followed a properly conducted operation when the infection was found clinically in a young person to be confined to a single group of nodes It is interesting to note that enthusiastic support is still given to surgical excision by those practising in areas where the disease continues to be prevalent

The eyes are prominent and the stare is the most noticeable feature The eyeball is pushed forward by increased tension in the orbit to produce exoph thalmos the eyelids both upper and lower are retracted The eye movements may be limited in extent due to a generalized myopathy which is often most severe in its effect on the extrinsic muscles of the eye The first muscle to be affected is often the superior rectus and as a result the patient has a limited field of vision and may see double when looking up

All systems of the body are affected by the increased secretion of thyroxine and the increased metabolic rate in which their constituent cells take part There is usually a voracious appetite accompanied by loss of weight and often diarrhoea All the reflexes are brisk in addition the patient is nervous and often jumps if disturbed by a sudden noise There is usually increased thirst and accompanying this frequency of micturition

Special tests

The clinical diagnosis of Graves disease is usually made very easily but there are occasions when the assistance of special tests may be helpful They are perhaps of most use in assessing the degree of severity of the condition and in following progress under treatment They are also valuable in distinguishing the patient with a non toxic goitre complicated by an anxiety state

The basal metabolic rate still remains the most reliable all round test of thyroid gland function in so far as it can be fairly easily carried out without too specialized or expensive equipment It must however be completed under resting or basal conditions which usually means that the patient should be in hospital for one night and have the test done first thing in the morning before breakfast A good tracing properly corrected for the weight and height will give a fair indication of the s verity of the condition (Robertson and Reid 1952) If the basal meta bolic rate is grossly at variance with the clinical appearance of the patient ner vousness may have l d to overbreathing and the test should be repeated after suitable sedation (Fraser and Nordin 1955) Leaks in the apparatus or a per forated ear drum can also produce big errors

Radioactive iodine as a diagnostic tool in hyperthyroidism is more extensively used every year There are three main ways in which it is employed depending on the measurement of the amount of radioactive iodine taken up by the thyroid gland excreted in the urine and bound to protein in the blood serum There are a number of conditions other than hyperthyroidism which may give raised results These include patients who have been recently treated for Graves disease and are now clinically euthyroid those who have simple goitre due to iodine d ficiency and those who have familial inborn errors of iodine metabolism which show a high radio-iodine uptake in the presence of a normal metabolic rate Another method of measuring thyroid gland activity using radio-iodine is to give the patient 5 or 10 μc by mouth or by intravenous injection and then to count the rate of uptake of the radio-iodine over the neck at intervals under standard conditions A third method is to take a sample of blood one day after the dose has been given and having precipitated the proteins estimate the protein bound radioactive iodine

The best index of thyroid gland function is the protein bound iodine (*not* radioactive protein bound iodine) which has a normal range of 4–8 μg Unfortunately a special iodine laboratory is required for its determination and therefore it can only be used in a very few centres

CHAPTER 42

HYPERTHYROIDISM AND THYROID SWELLINGS

SELWYN TAYLOR

HYPERTHYROIDISM

IT IS a great convenience when discussing hyperthyroidism to distinguish between the pattern of symptoms in the young patient and that seen in those who are older and have nodular glands In the typical young adult who develops thyrotoxicosis there is usually a moderate degree of protrusion of the eyes associated with nervousness and sweating as well as an increased pulse rate weakness and increased appetite Such a condition can be designated as Graves disease since we owe much to that Dublin physician who in 1835 drew attention to this syndrome On the other hand the patient who has had a nodular goitre for many years and develops thyrotoxicosis often has symptoms that pass unrecognized for some time It is then rare to see much nervousness or exophthalmos and the brunt of the disease falls on the cardiovascular system so that the patient may present in the first instance with auricular fibrillation or congestive heart failure For the purposes of this chapter the latter condition will be referred to as toxic nodular goitre

There is no doubt that every gradation of thyroid gland disease can be seen bridging these two distinct varieties of hyperthyroidism but it is convenient to discuss them separately since the prognosis and the kind of treatment indicated varies very much in the two extremes

Graves' disease

Hyperthyroidism developing in the young adult whose thyroid gland is not nodular is about six times as common in women as in men There may be a *history of greatly increased worry or mental stress but quite often no cause can* be discovered In the past many workers have tried to describe the typical subject prone to develop this disease and there seems no doubt that such a psychosomatic type exists There are many families with a marked predisposition to this condition

The disease can present in a variety of ways There may be a brisk attack of diarrhoea increased nervousness and intolerance of other people amenorrhoea or protrusion of the eyes On examination the patient is usually a little nervous or jumpy and often finds that she needs less warm clothing and cannot get enough air The palms of the hands are typically moist the pulse is fast and very readily felt because of the big pulse pressure The pulse pressure is increased because the diastolic pressure is lowered by peripheral vasodilatation The patient may have noticed attacks of palpitation and is probably breathless going upstairs There is often generalized weakness especially of the muscles of the legs so that sometimes the first complaint is one of the knees giving way

The modern technique for subtotal thyroidectomy using a crease incision leaves a minimal scar and if even this is worrying to the patient it is very easy to conceal with a string of beads Massaging the scar after operation with a little lanoline or cold cream morning and evening may assist but the patient should be warned against wearing high necked woollen jerseys or cardigans which may touch the scar as the irritation of the wool may lead to keloid

ANTITHYROID DRUG TREATMENT —Patients with Graves disease may be unsuitable for operative treatment either because they are mentally disturbed or because they have some other condition affecting the cardiovascular or respiratory systems which precludes the giving of general or local anaesthetics Pregnancy in the last trimester is also a contraindication For these reasons it may be considered necessary to give long term treatment with an antithyroid drug The treatment of choice at the present time is carbimazole (Neo Mercazole) which is given in a dose of 5–10 mg 3 times a day This prevents the synthesis of thyroxine so that the patient notices improvement on about the fourth day and this progresses for some weeks until a euthyroid state is obtained (Burrell Fraser and Doniach 1956) If the patient puts on much weight or feels lethargic the dose should be reduced It is usual after 2 months to be able to halve the dose and later use only 5 mg a day

A small proportion of patients respond unfavourably to antithyroid drugs the commonest reactions being a red eczematous condition of the palms especially of the ball of the thumb fleeting pains in the joints a diminished white c ll count and finally agranulocytosis which is a most serious complication Because of the risk of agranulocytosis any patient for whom antithyroid drugs are prescribed must be told that at the first sign of a sore throat they should stop taking the drug and report immediately to a doctor Treatment resolves itself into immediate transfusion of fresh blood and massive dosage with wide spectrum antibiotics

Another drug which has found favour in the long term treatment of Graves disease is potassium perchlorate (Crooks 1957) This drug exerts its effect by preventing the thyroid gland from trapping iodide from the blood stream and does not interfere with the synthesis of thyroxine It is tolerated in large doses of 100–200 mg 3 or 4 times a day with no toxic effects other than occasional mild dyspepsia It finds its main usage in the treatment of children

RADIOACTIVE IODINE THERAPY —The use of radioactive iodine for treating Graves d s ase has found increasing favour but by general agreement in Great Britain those under the age of 45 years are not given the isotope if there is any other reasonable method of treatment (Pochin 1957) The reason is that such intense radiation is given to the gland that the risk of malignant disease developing many years later cannot be excluded The main use therefore for radio iodine therapy is the patient who has already had one operation for Graves disease and who has subsequently relapsed This is especially the case if at the initial operation damage to a recurrent laryngeal nerve or other injury took place since further surgery would then carry an extra risk The isotope should never be given during pregnancy except before the fifteenth week but is best avoided altogether It is not so effective in older patients with toxic nodular goitre who may require very large doses

There are two ways of giving radioactive iodine After a tracer dose which indicates approximately the percentage taken up by the gland either a standard dose of about 7 mc (MacGregor 1957) is given or an attempt is made to calculate

Treatment

There are at least three satisfactory methods of treating Graves disease today and the problem therefore resolves itself into deciding which is the one best suited to any particular patient These three methods are subtotal thyroidectomy after suitable preparation of the patient long term therapy with antithyroid drugs, and the use of radioactive iodine

THYROIDECTOMY —The preparation of the patient followed by subtotal thyroidectomy still remains the method of choice for most of those suffering from Graves disease The reasons for this are that the treatment can be carried out with only a short stay in hospital, the preliminary preparation being given as an out patient and there usually being no need for long term specialized after care Typically the patient when moderately toxic is given carbimazole (Neo Mercazole) 10 mg 3 times a day by mouth for 6 weeks up to 3 months until there is a steady gain in weight, a fall in the pulse rate and a general sense of well being At the end of this time the patient is started on a course of iodine by mouth which can conveniently be given as Lugol s solution 5–10 m 3 times a day This reaches the peak of its usefulness in about 10–20 days when the thyroid gland becomes very firm to the touch and therefore much less vascular and the patient feels extremely fit At this stage the patient goes into hospital and has an operation designed to remove about seven eighths of the thyroid gland together with the isthmus and pyramidal lobe (Riddell 1956) The post operative course is usually smooth and the patient leaves hospital within 1 week

Before operation the patient should be warned that a small risk is entailed of injury to the voice since even in the most skilled hands the recurrent laryngeal nerve is occasionally damaged and one vocal cord paralysed Such an injury however is not usually followed by permanent impairment and the voice often returns almost to normal in 3 months, although there may thereafter be an inability to make loud sounds or to sing as well as previously Other post operative complications are haemorrhage which today is rare, and the gradual development of hypothyroidism or myxoedema which may follow the too generous removal of thyroid tissue

It is usual to find that where the thyroid gland histologically contains an abundance of lymphoid tissue and lymphocytes the occurrence of myxoedema following operation is likely Thus a pathologist s report on the tissue removed is of great help in giving a prognosis as to recurrent Graves disease or myxoedema

Another complication which fortunately is rare is inadvertent removal of the parathyroid glands so that hypoparathyroidism develops The usual story is that 2–4 days after operation the patient complains of tingling in the hands and feet, tapping over the facial nerve elicits a twitch of the facial muscles (Chvostek s sign) and a tourniquet applied to the arm produces a main d accoucheur (Trousseau s sign) Giving calcium gluconate 10 ml of a 10 per cent solution intravenously immediately relieves these symptoms, and placing the patient on a high calcium intake, for example 3 effervescent calcium tablets a day is often sufficient to prevent further trouble the Calcium Sandoz tablets each contain the equivalent of 4 g of calcium In many patients the condition resolves itself because usually a small amount of parathyroid tissue has survived Rarely hypoparathyroidism is permanent and then the use of calciferol 50 000 units once or twice a day or dihydrotachysterol (A T 10) an oily solution 4–10 ml given by mouth may be indicated the dose being gradually reduced to 0 5 ml daily

Finally when all else fails orbital decompression is employed with removal of the superior and lateral bony orbital walls (Rowbotham and Clarke 1956)

In many patients the exophthalmos undergoes spontaneous arrest after months or years and it is then necessary to help the patient live as comfortably as possible with the disability A lateral tarsorrhaphy which approximates the outer ends of the eyelids may greatly improve the cosmetic appearance Since the cornea is exposed to injury the wearing of spectacles with broad sidepieces minimizes the risk of dust or other irritation reaching the eyeball

Exophthalmos is accompanied by varying degrees of weakness and paralysis of the eye muscles hence some of the names for the condition, such as exophthalmic ophthalmoplegia Upward movement goes first and later all the ocular muscles are involved so that the patient can only see directly in front There is rarely much improvement in this disability and post mortem studies of the muscles suggest that fibrosis is the cause Fortunately the myopathy often becomes arrested spontaneously and does not progress to complete immobility of the eye

THYROID SWELLINGS

When faced by a patient with a nodule in the thyroid gland the first question confronting the examiner is whether it is simple toxic or malignant Since the diagnosis of the toxic thyroid gland has already been discussed only the simple or malignant nature of the swellings will be considered here

Simple swellings

Simple goitre is by far the commonest cause of thyroid gland enlargement and may be endemic sporadic or congenital

Endemic goitre is always related to iodine deficiency and such thyroid glands develop nodules with the passage of time (Taylor 1956) It has been estimated (Kelly and Snedden 1958) that there are about 200 million people in the world today with simple goitre and the natural history of the disease has been well documented Certainly the condition is compatible with long life and the main disability is due to pressure on structures in the neck or upper mediastinum which is usually gradual or may be sudden when there is haemorrhage into a nodule There is also the risk of a toxic change in the gland and finally the extremely unlikely one of malignant degeneration

Simple or benign adenoma

As described above simple nodules in the thyroid are not true tumours however a benign adenoma can occur but appears to be very rare

Foetal adenoma

The foetal adenoma which owes its name to its primitive looking cells and follicles is not a foetal remnant but one end result of localized hyperplasia and involution its follicles are functionless

Natural history

The natural history of thyroid gland enlargement in an endemic area is that children are noticed to have rather full necks the incidence being higher among the girls After puberty there is a tendency for the thyroid gland to enlarge with each menstrual period and very considerably during pregnancy In males there is a great tendency for the thyroid gland to become smaller except in areas of

the dose needed for the particular patient aiming at giving about 140 μc per gramme of tissue Naturally the weight of the thyroid gland has to be guessed from palpation of the neck and this is difficult

There are few complications of isotope treatment, the patient drinks the radio iodine and in a few weeks there is a gradual reduction in the activity of the gland reaching its maximum in about 3 months Occasionally a little soreness may be felt in the neck but no other complaint is likely There is usually a higher incidence of myxoedema following radio iodine therapy than any other form of treatment, but this is no contraindication since the patient can be given thyroid by mouth

Toxic nodular goitre

Toxic nodular goitre the second type of hyperthyroidism is typically seen in the older patient who has had a nodular goitre for some years and in whom the onset of symptoms is often insidious The cardiovascular system is most affected and cardiac enlargement fibrillation and congestive failure may be expected There may be a little sweating and the basal metabolic rate will be raised but eye signs and nervous changes are mild or absent There is often loss of weight

Diagnosis is aided by determination of basal metabolic rate radioactive iodine uptake, or estimation of protein bound iodine

The treatment of toxic nodular goitre should always be a subtotal thyroidectomy for it is found that this type of gland is more resistant to antithyroid drugs and radioactive iodine than is the thyroid gland of Graves' disease It is surprising how often these patients can be made fit for surgery a protracted course of carbimazole by mouth followed by Lugol s iodine will almost always make the patient fit for a general anaesthetic In the aged that is those patients over the age of 80 years it is often desirable to operate under local analgesia and it is best then not to confine the patient to bed The operation is designed to remove rather more of the gland than for Graves disease, and only a thin shell of tissue is left on each side of the neck Myxoedema does not occur however thorough the excision and it is remarkable how these patients improve after operation

Exophthalmos

Perhaps the most disagreeable complication which may accompany hyperthyroidism is severe exophthalmos and it occasionally worsens when the hyperthyroidism is treated It does not seem to matter how the hyperthyroidism is controlled thyroidectomy radioactive iodine and antithyroid drugs may all be followed by exophthalmos The eyes start from the head the eyelids and conjunctivae become suffused and oedematous and eventually there may be perforation of the eye and blindness (Dobyns 1956) Since the cause of this condition is not known treatment remains empirical and is mainly directed at relieving the symptoms

Tarsorrhaphy may protect the eye over a critical period and the giving of large doses of thyroid by mouth is considered by many to be beneficial The rationale of the latter is that it suppresses the secretion of thyrotrophic hormone (T S H) by the anterior pituitary gland and it is generally considered that this hormone is secreted in excess in exophthalmos

Small doses of x rays may be given to the orbits and in the early stages may result in remission Alternatively, much heavier dosage may be given to the pituitary gland with the intention of trying to reduce the secretion of T S H

Papillary carcinoma

Papillary carcinoma occurs in the younger age group and is often slow to grow and spread usually by the lymphatics It is the type occasionally found in children and young adults and provided in the past the so-called lateral aberrant thyroid gland Thus is a condition in which highly differential thyroid metastases involve the lymph nodes in the supraclavicular fossae and biopsy specimens look like normal thyroid tissue on histological examination Growth may be extremely slow and there are reports of patients who have had this disease for 20 and 30 years many die from other causes

TREATMENT—The treatment of papillary carcinoma is almost entirely surgical since it is unusual for the metastases to take up radioactive iodine and they resist deep x ray therapy

Treatment consists of total removal of the lobe in which the nodule is found together with any affected lymph nodes The patient is given at least 3 gr of dried thyroid by mouth per day or 0 3 mg of thyroxine to suppress pituitary activity and discourage further tumour growth The patient is seen regularly and any further enlarged lymph nodes excised In the occasional more rapidly growing tumour with cervical lymph node involvement wid r dissection is nec sary Where nodes within the upper mediastinum are affected it is neces sary to split the sternum and remove the thymus gland and the affected nodes The results of surgical treatment are good and many patients may be expected to survive the usual span of life

Follicular carcinoma

Follicular carcinoma is seen in an older age group reaching a peak between the ages of 40 and 60 years At least 50 per cent of the patients report with symptoms due to metastases Follicular carcinoma tends to reproduce thyroid follicles and often develop as a large smooth swelling in the gland When present for many years it is hard to say if it has been malignant *ab initio* or whether malignant degeneration has taken place in an existing nodule Spread is usually by blood stream to bones and lungs

TREATMENT—The first step in the treatment of follicular carcinoma is total thyroidectomy since this removes primary tumour and all functioning thyroid gland As myxoed ma develops the anterior pituitary stimulates the metastases to manufacture hormone If they are successful they will take up radioactive iodine and a therapeutic dose of 100–200 mc can be given Uptake in metastases is determined 2 months after total thyroidectomy by giving a tracer dose and scanning the patient (Pochin and his colleagues 1952) Unfortunately many do not take up radioactive iodine The risks of radio iodine therapy are amenorr hoea aplastic anaemia and leukaemia

Anaplastic carcinoma

Anaplastic carcinoma an undifferentiated type of tumour is common usually occurring in older patients The thyroid gland enlarges and pain may radiate to the back of the ears Often a recurrent laryngeal nerve is involved leading to hoarseness The patient loses weight The thyroid gland feels firmer than usual and is often attached to surrounding structures

Radio-iodine treatment is useless and attempts at surgical excision rarely complete The most suitable treatment is deep x ray therapy which often produces a good remission though recurrence is likely

high endemicity At 30 years it will be noticed that nodules have developed in the gland These can be shown to represent areas of focal hyperplasia which undergo central necrosis owing to haemorrhage and are then usually replaced by areas of colloid or masses of functionless follicles (Taylor 1958) Continuing development of these foci gives the multinodular goitre

Pressure, in the first instance, is exerted by the thyroid gland on the great veins and this is shown by large veins becoming apparent over the skin of the upper chest Later the arteries may be pressed upon but they resist this very well The trachea may be displaced and in addition flattened from side to side —the so called scabbard trachea Continued pressure may lead to softening of its cartilaginous rings and great dyspnoea when the head is turned in certain directions Pressure on the sympathetic nervous chain may give rise to a Horner s syndrome but it is very rare for the recurrent laryngeal nerves to be paralysed by a simple goitre

Indications for operation

The indications for operation on a non toxic nodular thyroid gland are the suspicion of malignancy pressure changes and cosmetic reasons A malignant change is suspected when a patient complains of pain in the neck the gland begins to grow rather rapidly and feels excessively hard or thick or when a recurrent laryngeal nerve is involved leading to hoarseness Likewise in a young patient with a solitary nodule the incidence of malignancy is higher than in the multi nodular gland and thus is a good reason for surgical excision

Surgical treatment

The operation will depend on the state of the gland Where a single nodule is present the whole of the lobe is removed together with the isthmus Where the gland is multinodular a partial resection of both lobes, including isthmus and pyramidal lobe is carried out Less tissue is removed than in the operation for thyrotoxicosis and of course many tiny nodules may have to be left following which it is desirable to give the patient small doses of thyroid by mouth to inhibit their further growth

Prevention

The prevention of simple goitre is possible and should be encouraged at all costs The necessary intake of iodine to prevent thyroid gland enlargement is about 100–200 μg per day usually the diet contains this but in some areas it does not The use of iodized table salt is all that is then needed to obtain the necessary amount (Holman 1958) and it is a tragedy that more countries do not adopt its use particularly as there are no contraindications and the resultant saving in sickness and hospital beds would be enormous

Malignant swellings

Cancer of the thyroid gland is a rare disease only a little over 300 people dying from this condition in England and Wales each year according to the Registrar General s returns However it is a condition which occurs more com monly where goitre is endemic (another reason for the use of iodized salt)

It is necessary to consider three rather different pathological types to understand the natural history spread and prognosis of the disease These are called papillary follicular and anaplastic (Warren and Meissner, 1953)

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Histological diagnosis is established by biopsy and histological examination of the gland either by open incision drill (Morrison and Deeley, 1957) or split needle (Hamlin and Vickery, 1956) X ray therapy should be started at once If tracheotomy is necessary a plastic tube permits therapy to continue

Differential diagnosis includes reticulosarcoma and thyroiditis Reticulosarcoma may metastasize to the gut and cause melaena Subacute thyroiditis of de Quervain may produce rapid enlargement and pain Hashimoto s thyroiditis rarely simulates carcinoma the liver function tests are abnormal *gamma* globulins increased and precipitins present (Roitt and his colleagues, 1956)

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